Scientific American established 1845. Scientific American Supplement. Vol. XLV, No. 1151.

NEW YORK, JANUARY 22, 1898.

Scientific American Supplement. \$5 a year. Scientific American and Supplement. \$7 a year.

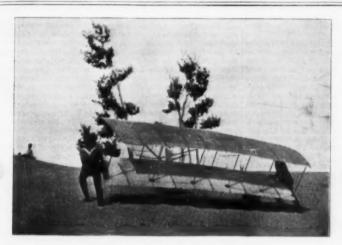


Fig. 22.—GOING BACK AGAIN.

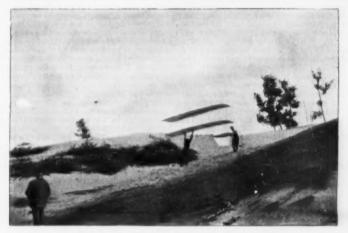


Fig. 28.—NEAR THE STARTING POINT.



FIG 24.—TWO SECONDS AFTER START.



Fig. 25.—FOUR SECONDS AFTER START.



Fig. 26.—FIVE SECONDS AFTER START.



Fig. 27.—NEARLY DOWN.



Fig. 28.—QUARTERING.



FIG. 29.-WINDING UP GRAVITY SPRING.

EXPERIMENTS IN AERIAL GLIDING.

[Continued from Severannes, No. 1160, page 1888.]

(GLDING EXPERIMENTS.\*\*)

(GLDING EXPERIMENTS.\*\*)

(GLDING EXPERIMENTS.\*\*)

(GLDING EXPERIMENTS.\*\*)

(Fig. 22 by shows the apparatus being carried back preparatory to making another glide. These were generally 200 or 200 feet long, and occupied eight to four teen seconds, although it takes nearly twenty minutes to describe one of them. The sport is so edelight of, the sensation of flying through the air is so delightful, the sensation of flying through the air is so delightful, the sensation of flying through the air is so delightful, the sensation of flying through the air is so delightful, the sensation of flying through the air is so delightful, the sensation of flying through the air is so delightful, the sensation of flying through the experiment of the present addition which the sensation of flying through the follower. The sensation of flying through the follower of the present glide, and the effort has been made to have each represent a different phase, so that the sequence of lard transit might be follower.

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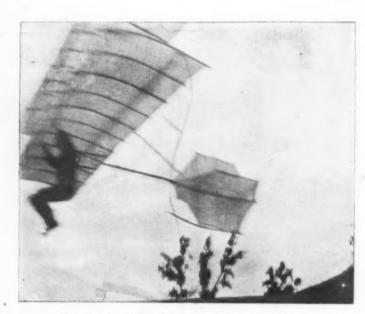


Fig. 30,-TURNING IN QUARTERING FLIGHT.



FIG. 31.—QUARTERING FLIGHT OVERHEAD.

ages so great that the 25 pounds weight of machine often became almost a negligible factor beside the forces which had to be occasionally contended with, unless great care and quickness of action were exercised to always point the front of the apparatus into the momentary direction of the wind; the accurate judging of the extent of these momentary changes was a matter in itself which required considerable practice.

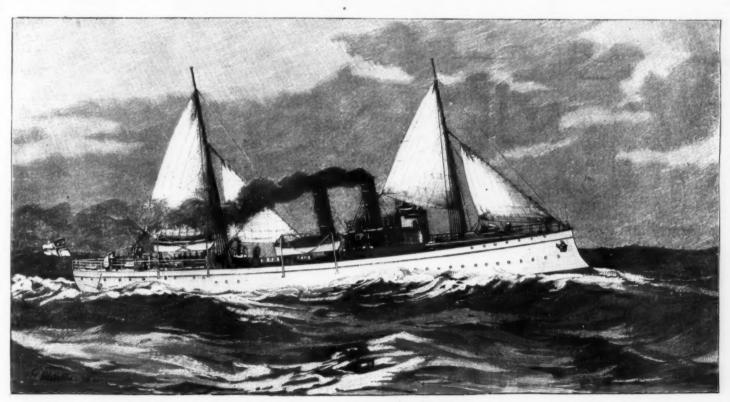
Another difficulty of handling the machine on the steep slope was, he said, due to a property peculiar to arched surfaces, namely, to a strong propelling component which they possessed at small positive, as well as negative, angles of inclination (to the horizontal), when held in a strongly ascending current of air, such as always existed in winds at the hillside. This propelling component, which tended to force the carrier back down the hill against the wind, would frequently be brought about by gusts, or disturbances in the wind which affected the vertical trend and produced these propelling components so suddenly and with such force, in winds of twenty miles an hour or over, that it was generally safer to employ two men to carry what in a calm would be a comparatively light load for one.

After arriving at the starting point, which, he said, was not at top of the hill, but just a few feet beyond the position shown in the Fig. 23, the apparatus was held with the chord of the surfaces pointed downward at a considerable negative angle in order that the machine should sustain only its own weight, and at the same time the apparatus was directed squarely into the momentary wind so that both sides lifted equally, and, while the machine was thus poised, the operator (in front of the apparatus was directed squarely into the momentary wind so that both sides lifted equally, and, while the machine was thus poised, the operator (in front of the apparatus) released his hold and slipped quickly underneath, passing his arms over the longitudinal bars (called arm bars), beneath the lower surface, at the same tim

were marked by numerous movements of the operator requiring great quickness and considerable bodily strength, which tired one almost as much has carrying to the surfaces, when the machine and operator were the machine single handed up the hill. He said, to the surfaces which the said was only necessary to give a slight positive inclination the machine was an operator were the most included in the surface and operator were the most and to be contended with by either the operator or the mechanism, one might recall the actions of smoke issuing from a chimney, which, if watched for any two succeding fractions of a second, would show that its consisted of thousands of irregular curves and twists which came with a suddenness and irregularity greater than any man could intelligently follow, even mentally. He stated that their experiments had convinced them that similar disturbances existed throughout all winds, even the most steady, and that as each of these changes or "gasts" had its disturbing effect on any apparatus depending for dynamic support on the air, it was plain to be seen why Mr. Chantuc had placed so much importance on the problem of securing automatic equilibrium, as the latter was undoubtedly by far the most important of all the many difficulties connected with the whole subject. Consequently, nearly all of their recent experimental work had been directed to a study of these "gusts," or wind changes, and especially to the counteraction of their disturbing effects by automatic machinery. For both felt convinced that without ample provision for automatically and the provision for automatically and their recent experiments had been accomplished by would be out of the question. Mr. Herring said be felt himself to be too nunch of an enthusiast to experse his own opinion of what had been accomplished by would be out of the question. Mr. Herring said be felt himself to be too nunch of an enthusiast to experse his own opinion of the results, which he said were substantially as follows: That, whereas the maximum

<sup>\*</sup>An address by Octave Chanute, C.E., Mem. W. S. E., delivered before the Western Society of Engineers, October 20, 1897, and published in the

the beach, the apparatus immediately rose, sometimes with greater rapidity than it fell, to almost the same greater rapidity than it fell, to almost the same interest of the same time, to head the machine distribution of riding on the air from all other modes of locomotion was the examinations between the same time, to the machine, which were practically equal to the machine, which were practically equal to the machine, which were practically equal to the machine, which were practically imparted to the machine, which were practically imparted to the machine, which were practically equal to the machine, which were practically equal to the same time, to the dath reversal the same time, to head the machine directly into the same time, to head the machine directly into the same time, to head the machine of flight the entered as a special work the same time, to head the machine directly into the same time, to head the machine directly into the wind, as was being done in Fig. 23, the landing point, and at the same time, to head the machine of flight the entered in which were the same time, to head the machine of flight the entered in which were the same time, to head the machine of flight the entered in which as a work of the same time, to head the machine of flight the entered in which as a work of the same time, to head the machine of flight the entered in which as a work of the same time, to head the machine of flight the entered in which were the same time, to head the machine of flight the entered in which were the same time, to head the machine of flight the entered in which were the same time, to head the machine of flight the entered in which were the same time, to head the machine of flight the entered in which the same time, to head the machine of flight the entered in which the same time, to head the machine of flight the entered in which the same time, to head the machine of flight the entered in which the same time to head the machine of the proper landing point, and at the same time, to head the machine



THE "ERSATZ ILTIS," OF THE GERMAN NAVY.

thus showing that in flights against the wind the ascending trend of the latter thowing from the lake over the hill formished but little more energy than that the hill formished but little more energy than that the length of flight measured on the ground, and that the length of flight measured on the ground in gliding against the wind, was more dependent upon the height from which the flight started than on the velocity of the wind.

The GERMAN GUNBOAT "ERSATZ ILTIS." Is addition to the cruisers of various types, little work used in the case of the light in any other direction with the present machines was impossible. He wished, therefore, to call attention to Figs. 29, 30, and 31, which represent machine was impossible. He wind, in order to make use of the ascending current over the slope, which furnished in these flights over the slope, which furnished in these flights to the wind, and or the wind, in order to make use of the ascending current over the slope, which furnished in these flights to the wind, and all the superimposed surfaces in covering a distance of 28. Schielance of the superimposed surfaces in covering a distance of 28. Schielance in the superimposed surfaces in covering a distance of 28. Schielance in the superimposed surfaces in covering a distance of 28. Schielance in the superimposed surfaces in covering a distance of 28. Schielance in the superimposed surfaces in covering a distance of 28. Schielance in the superimposed surfaces in covering a distance of 28. Schielance in the superimposed surfaces in covering a distance of 28. Schielance in the superimposed surfaces in covering a distance of 28. Schielance in the superimposed surfaces in covering a distance of 28. Schielance in the superimposed surfaces in covering a distance of 28. Schielance in the superimposed surfaces in covering a distance of 28. Schielance in the superimposed surfaces in covering a distance of 28. Schielance in the superimposed surfaces in covering a distance of 28. Schielance in the superimposed surfaces in coverin

navigation. The result has been astonishing. Not only have the apparent truths concerning the drifts been shown clearly, but new facts of which no navigator ever dreamed brought to light.

Of the bottles recovered, eighty-one were cast overboard within the limits of the North Atlantic, nine in the South Atlantic, eight in the North Pacific, eight in the South Pacific and three in the Indian Ocean. Three bottles crossed the equator. Of these, two were in the Standard, both going from south to north. The first was thrown overboard from the steamship "Euphemia" and 1896, in latitude 7:40 south, longitude 21 west. August 4, 1896, this bottle was recovered in latitude 14:40 north, longitude 61 west. It had been journeying the whole surface of the sea, generally speaking, is converted into a slow current moving to leeward. When, owing to the interposition of any obstacle, the mass of water carried by the drift accumulates to such an extent that an outlet becomes necessary, the result, longitude 10:36 west, having traveled 1,300 miles in 131 days, drifting 9-5 miles each day. The trip of the third bottle began in the China Sea, and it went from north to south. It was dropped overboard by a representative of the Hydrographic Office from the ship "Sian, "August 18, 1895, in latitude 18:13 north, longitude 116:06 east. June 7 of the following year it was found in

10:15 west. This bottle journeyed 900 miles in 234 days, or 3.8 miles a day. The third bottle was dropped overboard from the steamship "Gerona," September 5, 1896, in latitude 58:05 north, longitude 30:26 west. It also was found on the west coast of Ireland, February 28, 1897, in latitude 53:12 north, longitude 9:10 west. Nine hundred miles was the distance traveled in 176 days, 5-1 miles being the average daily journey.

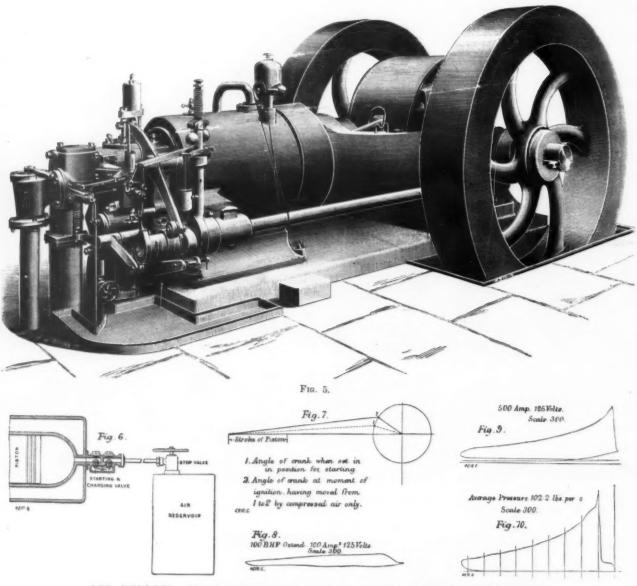
Two bottles were thrown overboard within fifty miles of each other, and landed, one on Andros Island, West Indies, the other on the shores of Finisterre, France, Another pair likewise were thrown overboard within a few miles of each other and near the northern limits of the Gulf Stream. No. 1 reached its destination on Abaco Island, West Indies, while No. 2 landed at Arachon, France.

A noteworthy member of the drifts is that of the bottle No. 45, thrown overboard from the steamship "Wittekind," April 25, 1896, in latitude 2:09 south, longitude 30:25 west, and picked up September 3, on the African coast, at the mouth of the Bathurst River, Gambia. This bottle, set adrift in the strong south equatorial current, must have been transferred to the current, and by it carried to the exceptionally northern position on the coast of Africa at which it was recovered.

Dividing the lists up into groups, according to lati-

was recovered.

Dividing the lists up into groups, according to lati-



ONE HUNDRED HORSE POWER GAS ENGINE AT THE BRUSSELS EXHIBITION.

latitude 3 south, longitude 108 cast. Although it had traveled 283 days, the distance traveled was only 1,400 miles, or an average daily drift of 48 miles. These figures show better than all else the difference between the currents in the different seas. These figures show better than all else the difference between the currents in the different seas. Among the articles thrown overboard and recovered of which a record has been kept by the Hydrographic of which a record has been kept by the Hydrographic of which a record has been kept by the Hydrographic of the different seas. Although it had to the eastward it extends to the meridian of 40° being allotted to the group covering throughout which the surface curred of which a record has been kept by the Hydrographic of which a record has been kept by the Hydrographic of the highest day and the surface during the surface and the surface curred of the highest day and the surface during the surface curred of the various groups are obtained:

The accord has been kept by the Hydrographic of the surface during the surface curred of the various groups are obtained:

The accord has been kept by the Hydrographic of the highest day and the surface curred the surface curred to the surface curred to the various groups are obtained:

The become was a blook weep to verboard from the standard to the casterily drift spreads out like a fan, its northeast-app by the steamship "Kilanea Hou" in the straits between the islands of Hawaii and Maui and Maui

	0	Average drift per day.
North of 50°		. 5'3 miles.
Between 40° and 50°		. 5.3
Between 20° and 40°		. 5.0 "
Between 0° and 20°		9.8

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DIMENSIONS OF GAS AND OIL ENGINES BY THE DRESDNER GASMOTOREN FABRIK.

		Cylinder Diameter.	Cylinder Stroke,	Revolu- tions.	Brake Horse Power.	Gas and Oil Consumption per Horse Power per Hour.		Gas Con- sumption Running Idle.
jas motor	Horizontal	mm. 120	mm. 230	100	1:0	liters.	kg.	liters per hr.
11 80	norizontai			180	1.9	840	**	600
		200	400	160	8.1	869		kg.
Benzine motor	0.0	140	280	180	3.2			0.7
Petroleum motor	4.5	135	230	260	4.0		0.44	1:0
	6.6	190	190	250	7.3		0:44	1.8
44 16	Vertical	190	190	280	5.4		0.44	1.9
" semiportable	Horizontal	200	400	240	13.1		0.41	2.4
" motor	Vertical	310	300	180	21.8		0.33	3.1

it has been exceedingly satisfactory, the cyclical variation not exceeding ½ volt. This result is obtained by having an impulse at each cycle, no matter what the load may be, from no load to full load. The method in which this is carried out is very satisfactory, so that the year when running absolutely light, the charge is fired with the greatest certainty.

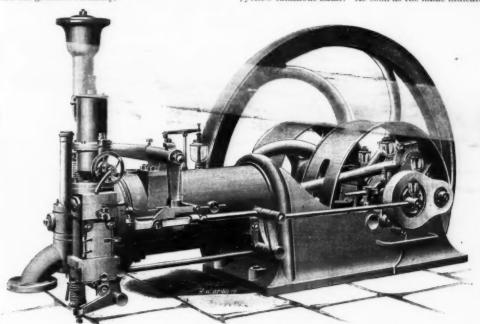


Fig. 11.—Gas Engine, Constructed by the Dresdner Gasmotoren Fabrik, Dresden.

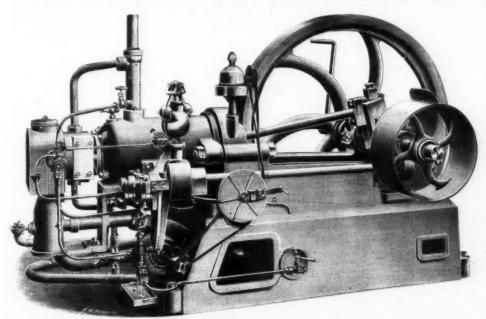


Fig. 12.—Hornsby-Akroyd Petroleum Engine, Constructed by the Ateliers de Construction de la Meuse, Liege.

## GAS AND PETROLEUM ENGINES AT THE BRUSSELS EXHIBITION.

The indicator diagrams. Figs. 8 and 9, show how perceptly the volume of the charge and the force of the except the volume of the charge and the force of the except the volume of the charge and the force of the except the volume of the charge and the force of the except the volume of the load. These diagrams are taken with loads varying from 100 amperes up to 50 amperes, corresponding to a range of from about 20 to 700 brake horse power.

The cylinder has a diameter of 20 in. with a stroke 27 in., the crank shaft being 8 in. in diameter in the main bearings being 14 in. in length and the crank in 10 in. The crank is balanced by a pair of countering the clearance space, rapidly mixes with the gas. Forming a highly explosive compound under a pressure of usually about 60 pounds per square inch.

Before sufficient air can obtain admittance to form an actively explosive mixture, the piston is put slightly explosive mixture, the piston is of usually accelerated, and the engine is predicted and the gas shut off. All that is required now to dea and the gas shut off. All that is required now to dea and the gas shut off. All that is required now to end and the gas shut off. All that is required now to end and the gas shut off. All that is required now to end and the gas shut off. All that is required now to end and the gas shut off. All that is required now to end and the gas shut off. All that is required now to end and the gas shut off. All that is required now to end and the gas shut off. All that is required now to end and the gas shut off. All that is required now to end and the gas shut off. All that is required now to end and the gas shut off. All that is required now to end and the gas shut off. All that is required now to end and the gas shut off. All that is required now to end and the gas shut off. All that is required now to end and the gas shut off. All that is required now to end and the gas shut off. All that is required now to end and the gas shut off. All that is required now to end and the gas shut off. The indicator diagrams, Figs. 8 and 9, show how perfectly the volume of the charge and the force of the explosion is graduated to suit the load. These diagrams were taken with loads varying from 100 amperes up to 500 amperes, corresponding to a range of from about 20 to 100 brake horse power.

The cylinder has a diameter of 20 in., with a stroke of 27 in., the crank shaft being 8 in. in diameter in the main body, while the crank pin is 11 in. in diameter, the main bearings being 14 in. in length and the crank pin 10 in. The crank is balanced by a pair of counterweights strapped to the crank throws, and continuous lubrication of the crank pin is provided for by an annular oil channel into which the oil is dropped from a fixed sight few diameters. The engine was designed for driving two diameters, one from each flywheel, the latter weight in the state with Fielding's self-starter, the

with sufficient force to enable the ordinary cycle to follow on.

Which the oil is dropped from a fixed sight fear independent. The engine was designed for driving two dynames, one from each flywheel, the latter weighing about 5 ions each.

The engine is fitted with Fielding's self-starter, the action of which is so follows: The erank being placed at an angle of about 15 degrees above the near dead center (Fig. 7) gas is admitted to the combustion space.

engine very greatly from what would otherwise be a very severe blow.

As showing the power with which the engine is started, we may state that the average pressure of the card (Fig. 10) works out at about 102 pounds per square inch, throughout the stroke, while the ordinary working explosion under full load works out at only 80 pounds per square inch. The compressed air is stored up by the engine itself into a small reservoir (Fig. 6), the energy stored up in the flywheels serving for this purpose; the gas for the moment being cut off, and when required, a separate charging pump is fitted, worked either by hand or by power, but as a rule this is unnecessary.

required, a separate charging plimp is litted, worked either by hand or by power, but as a rule this is unnecessary.

The Hornsby-Akroyd type of petroleum engine is constructed by the Ateliers de Construction de la Meuse, Liège, and was exhibited in the Main Hall, where an 8-horse power engine working at 210 revolutions drove some of the ventilating machinery, also exhibited by the same firm. This type is on the well known four cycle principle, fitted with lamp, fan and ball governor. The lamp is only employed at starting, and the fan can be worked by hand for the same purpose. The petroleum tank is placed below the engine, and the oil is injected by a pump. In the case of this engine it is stated that, by improvements introduced in the vaporizer since it was erected in the exhibition, by which the feed has been slightly increased, the effective horse power has been raised from 8 to 11.

The Dresdner fasmotoren Fabrik exhibited two petroleum and gas engines of 8 horse power and 2 horse power respectively and a benzine on the spirit engine of 3 horse power. The side shaft is worked from a spurwheel driven by a pinion on main shaft. The larger engine has a petroleum lamp heating the receiver or vaporizing chamber, and in the smaller, gas is ignited by an electric spark. The details of the engines are practically the same; in the case of the benzine engine, however, there is a reservoir added for petroleum spirit, through which the supply of vapor is drawn into the ignition chamber. The company build gas and petroleum motors of various types and sizes, horizontal, vertical, semiporable, and also benzine motors. The latter are fitted gith a magneto-electric inpition device; the other motors are constructed for tube ignition. through which the supply of vapor is drawn into the ignition chamber. The company build gas and petroleum motors of various types and sizes, horizontal, vertical, semiporable, and also benzine unders. The latter are fitted with a magneto-electric lantition device; the other motors are constructed for the gas motors; the other motors are constructed for the gas motors; the others are provided with conical valves. The characteristic features of the gearing are not easily described without detailed references to diagrams. It may be stated, however, that the regulation is less complicated than it might appear from what we shall have to say under the circumstances. In the horizontal petroleum motors both the inlet and outlet valves are in the cylinder cover. The inlet valve is under control of the gas motor, which is substantially of the same construction, and of an oscillating horizontal pendulum. The crank pin visible on the right hand side of Fig. 11, and the links and intermediate lever in front, impart a to-and-fro motion to a fork attached to the vertical arm of the first mentioned lever. The lower part of this lever is itself forked, and embraces a small pivoted bar, against which a small projection, not visible in our engraving, presses at normal speed. The inlet valve is then opened. When the speed becomes excessive, another finger, projecting further than the one already spoken of, strikes the horizontal pendulum, before the first finger can touch it; the pivoted bar is thus tilted, and the inlet valve remains closed. The pendulum oscillates normally at each reciprocating motion, its extremity being raised by a little roller which we see to the left of the pendulum. At high speed this oscillation becomes more energetic; this action renders the regulation more sensitive. The pendulum is adjustable for various speeds by means of the counterweight on its right hand extension.

The exhaust valve is opened in a similar way. Its spiral spring is weaker than that of the inlet valve: it will, therefore, be automat

the curved lever, which we house on the circumstation.

For the gas motor illustrated the regulating pendulum is somewhat simpler. The starting gear comprises a lever, by means of which a disk is displaced in such a way that the lever actuating the exhaust valve is struck, not only by one cam, as in regular working, but by two cams; there will be no compression under these circumstances. The cylinder, cylinder cover and the valve chest are jacketed. We give above the dimensions of a few motors. The brake horse powers are in all cases considerably higher than the nominal powers. We are indebted to Engineering for the cuts and particulars.

## THE STEVENS VALVE GEAR FOR MARINE ENGINES.\*

By Andrew Fletcher, Hoboken N. J., Member of the Society.

the Society.

It has been urged upon me that the Transactions of the American Society of Mechanical Engineers should contain some record of the origin and introduction of the form of valve gear for beam engines which has grown to be so general in the sidewheel practice of the marine engine builders of the eastern section of the United States, and of which the firm with which I am connected has been for so many years an advocate.

I have thought that this could best be done by getting from Mr. Francis B. Stevens a communication to me in which this history should be included, and which I might illustrate by drawings from more recent practice. Accordingly, two letters are appended herewith, and the drawings are self-explanatory.

I may be permitted to add that Mr. Stevens is eighty-seven years of age, and is still an enthusiast upon

<sup>\*</sup> Paper presented at the New York meeting (December, 1897) of the American Society of Mechanical Engineers.

steamers of all kinds. My own connection with his form of valve gear began forty-four years ago, with my first connection with the old firm of Fletcher, Harrison & Company, during twenty-seven years; W. & A. Fletcher for three years; and the W. & A. Fletcher Company for the past fourteen years.

My Dear Mr. Fletcher: In answer to your request, send this letter in relation to the Stevens cutoff.

Previous to its introduction in the year 1840, the form of valve and valve gear in almost universal use on the steamboats navigating the rivers and bays of the Atlantic coast was by poppet valves, operated by a single eccentric and a single rock shaft, the admission and exhaust of steam being coincident. Expansion was effected by a butterfly valve on the steam pipe worked by cams on the shaft, which was called the camboard cutoff. On the Mississippi, at the date mentioned, the engines were the same as at present in use, having poppet valves worked by cams on the man shaft.

In the latter part of the year 1839 I invented the

the paddle and poppet valve on the ocean; and also in great part on the rivers of the Atlantic coast, and on the great lakes.

steamers of all kinds. My own connection with his form of valve gear began forty-four years ago, with my first connection with the old firm of Fletcher, Harrison & Company, during twenty-seve years: W. & A. Fletcher for three years: and the W. & A. Fletcher Company for the past fourteen years.

Hoboken, N. J., April 2, 1897.

My Dear Mr. Fletcher: In answer to your request, send this letter in relation to the Stevens cutoff.

Previous to its introducetion in the year 1840, the form of valve and valve gear in almost universal use on the steamboats navigating the rivers and bays of the steamboats navigating the rivers and a single cock shaft, the admission and exhaust of steam being coincident. Expansion was effected by a butterfly valve on the steam pipe worked by a use on the slaft, which was called the camboard cutoff. On the Mississippi, at the date mentioned, the engines were the same as at present in use, having poppet valves worked by cams on the mash shaft.

In the latter part of the rivers of the Atlantic coonselvent weed, she first open the account of the cog wheel and rack, in the manner set forth, for the more completely effecting our disjoint on the steam of the steam of the steam of the valves used on the Atlantic constitution was never used, being found nunecessary.

The patent was renewed in 1855 and expired in 1892, the great lakes.

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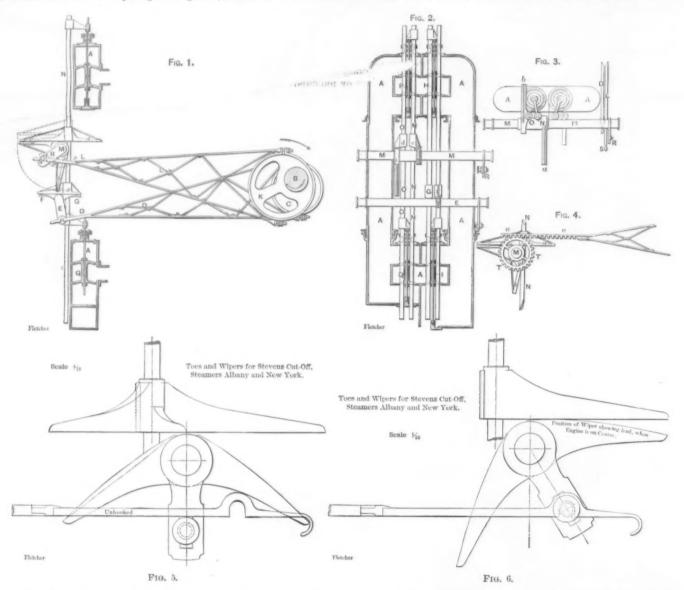
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The patent was renewed in 1895 and expired in



on the Hudson, I was unable to attach it to the engine until the following August, when the "Albany" was laid up for repairs at Cold Spring, opposite West Point, and the lead of the eccentrics. This vessel was the position of the arm of the management of the spring opposite West Point, and the lead of the eccentrics. This vessel was the large of the toes, the position of the arm of the earlier of the waste of the waste of the "Columbus," owner of the "Columbus," owner of the "Columbus," owner of the "Columbus," owner of the "Columbus, and the lead of the stroke. That of the "Columbus," as 40 inches diameter by 12 feet stroke. The cutoff as first applied was essentially the same as at present. On the "Albany" the length of the toes was 26 inches and the lift of the valves was 35 inches.

On submitting to my uncle, Robert L. Stevens, my model of the cutoff, made on a scale of 15 inches to the foot, he proposed an Improvement, by substituting a great of the columbus, and the lead of the devantage gained has not been considered equivalenced of the cutoff, made on a scale of 15 inches to the foot, he proposed an Improvement, by substituting a great of the columbus, and the lift of the valves was 35 inches.

On submitting to my uncle, Robert L. Stevens, my model of the cutoff, made on a scale of 15 inches to the foot, he proposed an Improvement, by substituting a great of the strain of the proposed an Improvement, by substituting a great of the strain of the main valves; secondly, the use of the strain on the 35th of January following, the columbus and the patient, a copy of which on a reduced scale, I annex. The patient was granted on the 35th of January following, the chains being as follows:

1. "The combination of an additional and separate eccentric wheel to work a rock shaft, to raise the steam and the main valves; secondly, the use of the strain on the patient, and a companied the patient, a copy of which on the strain of the patient, and the lead of the strain on the patient of the strain of the strain of the



was made by a butterfly valve placed on the steam pipe at its junction with the steam chest, and operated by two cams on the main shaft, pressing against the camboard and connected to the butterfly valve, and to a strong spring on its arm by a rod about half an inch diameter. The length of the cutoff corresponded to that of the cams, and the motion was exceedingly rapid. He at the same time increased the pressure from 2½ to 10 pounds per square inch. This cutoff was very successful and remained in use on all low pressure steamboats in this country long after the hand gear of Watt had been superseded by the eccentric of Murdock, and up to the introduction of the Stevens cutoff in 1840.

Mr. Andrew Fletcher. FRANCIS B. STEVENS.

Heboken, N. J., April 2, 1897.

My Dear Mr. Fletcher: I also send the following account of the eccentric, deriving its motion from the shaft which superseded the plug tree, tappets and detents of Watts, and was applicable alike to poppet and slide valves; and also add an account of the slide valve.

These were both patented by William Murdock, the foreman and partner of Watt, in 1799. The D slide is shown on Plate XVI of Farey; and in another form, now generally used, by Fenton, Murray & Company, on Plate XVIII.

an Plate XVIII.

A notable circumstance in regard to the slide valve that up to the year 1838, although it was then in niversal use on the locomotives and marine engines f England, and also on the locomotives of this country, had only sufficient lap, or cover, as it was then called, percent the steam from blowing through the cyliner. The Chevalier de Pambour, in his famous treatise n the English locomotive in 1836, gives a drawing of levalves then in use on them, showing little or no up; and although he writes very fully on the lead, he akes no mention whatever in his treatise of the lap of its effect.

In the year 1838 the eighteen locomotives of the

or of its effect.

In the year 1838 the eighteen locomotives of the Camden & Amboy Railroad had one-sixteenth of an inch lap. In the same year the steamer "Great Western" made her first passage. Her engines had the D slide, with little or no lap, and carrying two and a half pounds pressure per square inch. She had a separate cutoff valve somewhat like the camboard, but it was never used, the low pressure of steam rendering it almost nseless.

## OLD TIME PHARMACY.

OLD TIME PHARMACY.

The druggist's vocation is an honored calling in every civilized land, and its followers hold high places in every community. We have only to turn back the pages of the law records to find that a few centuries ago its followers were a guild of minor importance.

Before that the druggist was viewed as a creature familiar with the Evil Spirit. Still further back he was a wizard or medicine man, and beyond that point he is not to be found by modern science.

The history of pharmacy has never yet been written. All that we know of it is gathered from a passage in one book, and a reference in another, by a law in one country or an edict in a second, by ancient city ordinances and, queerest of all, by those invisible things we call words. Etymology and philology throw more light upon the subject than any book ever written.

Nearly all trades and callings have at least two names indicative of as many origins. Thus, the toiler at the loom has sent down through the ages the familiar names of "weaver," "webster" and "weber." Teaching is represented by teacher, tutor, instructor, professor and pedagogue, while the pharmacist, as if to show the importance of his profession in the social economy, can point to the long list of druggist, pharmacist, pharmaceutist, pharmacologist, pharmacographer, pharmagnosist, apothecary, leech, chemist, chymist, physic and pharmapolist. Each of these words carries a little lesson of its own. Druggist and drug are time-honored terms, and are found far back in English literature. In the prologue to the "Canterbury Tales," that great master, Geoffrey Chaucer, writes:

"There was also a doctour of phisik,"

"There was also a doctour of phisik,

Fu<sup>1</sup> whadde he his apotecaries To see "ragges and his lectuaries."

ORIGIN OF DRUGGIST.

on its effect.

In the year 1838 the eighteen locomotives of the Camera & Amboy Railroad had one-sixteenth of an inchep. In the same year the steamer "Great Western" ade her first passage. Her engines had the D slide, the little or no lap, and carrying two and a half bounds pressure per square inch. She had a separate toff valve somewhat like the camboard, but it was to low pressure of steam rendering it most useless.

ORIGIN OF DRUGGIST.

The root of druggist seems to be the same as of the word dry, and undoubtedly refers to the fact that nearly all the drugs in the dark ages were dried before being used for medicinal purposes. It is of interest to indicate the same calling, showing presumably that one group our own race had attained so high a superiority in pharmaceutical matters that the name of their calling was adopted by alien tongues.

century, and was taken in all probabilities from the French and Spaniards, who had obtained it from the Moors of Grenada. In the Moorish civilization the doctor was a chemist and a pharmacist. In the time of the Abencerrages they were the leaders of the scientific world, and their proudest title was chemist. Its adoption by the pharmaceutical calling shows that great progress had been made in the profession and that the standards of education had been raised to an appreciable extent in the preceding or seventeenth century.

and that the standards of education had been raised to an appreciable extent in the preceding or seventeenth century.

The term leech does not come, as is generally supposed, from the name of the aquatic worm, but from the older English or Saxon word lacee, a healer. The name of the worm probably comes from the same root, as the leech was used at a very early period to reduce inflammation, local and general. The word in its professional sense went out of use in the Addisonian period and is kept alive to-day by reason of historical or poetical associations.

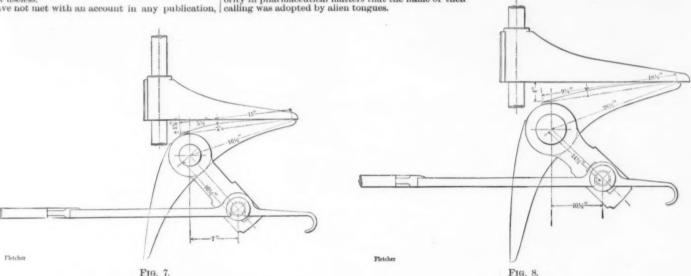
The best drug names are those derived from the old Greek word Pharmakon, meaning medicine, viz.: Pharmacy, the place where medicine is sold; pharmacist and pharmacologist, the master of the science; pharmacography, the description and classification of medicines, and pharmacographer, the describer. Then there are the little-used words pharmacomathy, pharmacognosis and pharmacologist.

The term physic, like its derivative adjective physician, was at one time applied to the apothecary. This use has passed entirely away, but was just as accurate as the present use of the word in the sense of a doctor of medicine.

As apothecary has passed from the meaning of store-keeper to that of pharmacist, correlate change may be

of medicine.

As apothecary has passed from the meaning of store-keeper to that of pharmacist, correlate change may be found in the development of the word surgeon. It is derived from the Greek cheir-ourgia, meaning working with the hands, or massage. The Latins adopted the word in the form chirurgia, meaning both a masseur and a bone setter. This became the chirurgeon of the Norman French and surgeon of our present speech. Surgeons had a similar history to that of the apothecary, as they were incorporated in 1540, along with the barbers. The small differentiation that existed between callings may be gathered from the fact that in



up to the year 1838, describing increased lap either in | text or drawings

up to the year 1990, describing interests of drawings.

The link motion was applied to the slide valve about that date. And in conjunction with it, in the course of a few years, the lap was gradually increased to its present extent, both liberating the exhaust in advance of the admission of steam and forming the efficient expansion gear in use on locomotives and screw steamers.

Yours truly,

Mr. Andrew Fletcher.

Francis B. Stevens.

Our practice with the Stevens cutoff at the W. & A. Fletcher Company has included its installation on over two hundred steamers new and old and large and small. We try to find out the amount of work required of the engine, and the necessary steam pressure, and then set the cutoff to suit. With the fixed cutoff, the owner need only notify his engineer of the proper steam pressure, and he runs with his throttle wide open. This plan gives a steadier and more regular running of the boat upon its time table than will be secured from adjustable cutoff in not too competent hands.

secured from adjustable cutoff in not too competent hands.

Not long since the writer was upon a steamer in New York Harbor, for which we had made a new cylinder and front in 1855, and had then applied the Stevens gear. It remains in good working order, and has given no trouble. With very fast running engines the wipers are made slightly different in shape, and we put springs on the lifting rods so as to force the toes to follow down the wipers. But we have never had any trouble to make the cutoff work satisfactorily.

I do not wish to be understood as opposing adjustable cutoff gear. We have made and fitted a large number of engines with Sickles' dashpot cutoff with adjustable gear with most excellent results. But there are often advantages in having so simple an arrangement as that which increases the speed by increasing the pressure, and which diminishes it by closing the throttle.

A German firm, it is reported, has placed upon the market samples of pure ingotin, derived from coal tar, which promises to supplant the vegetable indigo, as other dyes have been applanted by the same source. Vegetable indigo is consumed to the extent of \$15,000,000, chiefly decrease from India.

Although the apothecaries fought strongly for their rights to practice medicine and against oppression in their calling, yet in the next century they assumed a different attitude and fought the chemists and druggists, who had come into being and were regarded in England as members of a different industry. This trouble began in 1720 and lasted nearly up to the present century. Even to-day an incomprehensible distinction is drawn in Great Britain between the apothecaries on the one side and the "chymists and druggists" on the other.

The term chymist or chemist as used in pharmacy came into vogue in the early part of the eighteenth

Apothecary comes, of course, from the Greek. Its meaning in that language was storekeeper. The root "thek" is found in such words as bibliothek and glyptothek, the one being the equivalent of library and the other of a hall of sculptures. "Apo" is a mere prefix, so that apothek may be regarded as the Greek equivalent of the German "lager," as seen in lager beer, or of the English "storage," as employed in the expression a cotton-storage. Where and when it assumed its present meaning is difficult to determine, but was probably in Rome during the reign of the later Cæsars. The Romans carried it to all parts of Europe, so that its found to-day in about the same form in every Continental language.

That the word apothecary was clearly synonymous with pharmacist may be doubted. In 1606 the apothecaries were incorporated in England by a special act of Parliament. Queer as it may seem, they were not incorporated alone, but along with grocers, and it was not until 1617 that they obtained their great charter. Their classification with grocers would seem to indicat that they carried stocks of goods of non-medicinal as well as medicinal charge for his medicinal parts. There were surgeon-apothecaries, who did all these things and also set bones, acted as obsteted as medicinal charge on blue as obsteted as medicinal charge on but along with the expression in the caries who acted as medical men, prescribed and put medicine. There were surgeon-apothecaries, who did all these things and also set bones, acted as obsteted as the decidinal operations. There were surgeon-apothecaries, who did all these things and also set bones, acted as obsteted as the did libres in the did all these things and also set bones, acted as obsteted as the earlies and put did all these things and also set bones, acted as obsteted as medicine as obstemed, as obstemed, and but all great as obstemed in the surgers of surgeon-betrations. There were surgeon-apothecaries, who performed minor operations and seed medicine and her surgeon-betrates, who perfois

ators and all the other paraphernalia of the alchemist's laboratory. It was the druggists who taught the people of Scotland how to distill Scotch whisky and of Ireland to make the potheen. They had a high love and respect for their calling, and preserved a speaking knowledge of the Latin language for centuries. This they developed into the fantastic tongue which is no longer spoken to-day, but read and written by every physician and pharmacist.—Mail and Express.

easily raised of any. It is a very timid bird and was formed, the eyes of a deep leaden hue, the long, wide first imported from China in the early seventies. The bill of a pale flesh color or pinkish hue, and free from dark spots, the presence of black being a disqualification. The neck is slender and gracefully curved. The tandard weight of the standard weight of the standard weight of the long. Wide from China in the early seventies. The bill of a pale flesh color or pinkish hue, and free from dark spots, the presence of black being a disqualification. The neck is slender and gracefully curved. The long wide from the carriage and shape of its body. Its legs are set far back, which causes the bird to walk the gracefully curved. The head of the long wide from China in the early seventies. The bill of a pale flesh color or pinkish hue, and free from china in the early seventies. The bill of a pale flesh color or pinkish hue, and free from chart imported from China in the early seventies. The bill of a pale flesh color or pinkish hue, and free from dark spots, the presence of black being a disqualification. The neck is slender and gracefully curved. The body is long and oval, the breast full and round; the long with a pale flesh color or pinkish hue, and free from dark spots, the presence of black being a disqualification. The standard weight of the s

### DUCKS AND THEIR STANDARD BREEDS.\*

THE farmers of the United States were indebted to the United States Agricultural Department for the very interesting article on "Standard Varieties of Chickens," published in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 1023. And we herewith continue the publication of the series with an interesting article on the standard breeds of ducks of the United States and their management, prepared by Mr. George F.

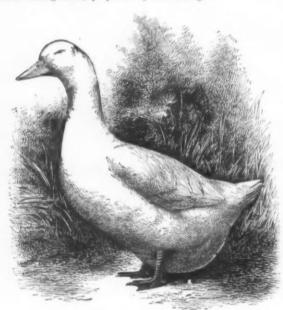


FIG. 1.-THE WHITE PEKIN DUCK.

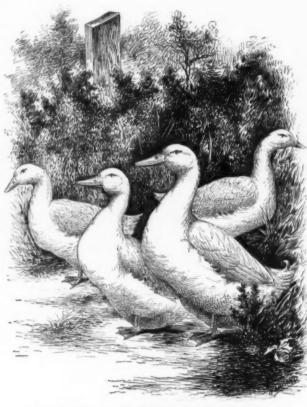


FIG. 2.—GROUP OF WHITE PEKIN DUCKS.

Howard, secretary of the National Poultry and Pigeon Association, and published by authority of Dr. D. E. Salmon, the Chief of Bureau of Animal Industry, in Farmer's Bulletin, 64.

There are ten standard breeds of ducks raised in this country, as follows: The White Pekin, White Aylesbury to the East Burletin, Colored Rouen, Black Cayuga, Colored Muscovy, White Muscovy, Gray Call, White Call, Black East Indian, and the Crested White.

Of these breeds the first six are considered profitable to raise; the two breeds of Calls and the Black Indian is large numbers, but are not so numerous in England in large numbers, but are not so numerous in England in large numbers, but are not so numerous in Sidered to be among the best of table fowls. They are also good layers; the number of eggs varies from 100 to 130 each for the season. The color of the bill, as the former is yellow and the latter a decicate pink or flesh color.

For farm purposes the Aylesbury possesses the many good qualities of the Pekin and can be bred with the same success. One advantage of the Aylesbury is that the same success. One advantage of the Aylesbury and elimate. Other points are its early maturity, great hardiness and large size, great prolificacy and real beauty. The plumage of an Aylesbury is a pure spot-less white and the standard weight of the adult drake is nine pounds, ducks eight pounds.

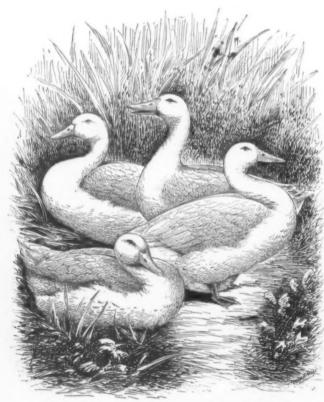


Fig. 3.-GROUP OF WHITE AYLESBURY DUCKS.

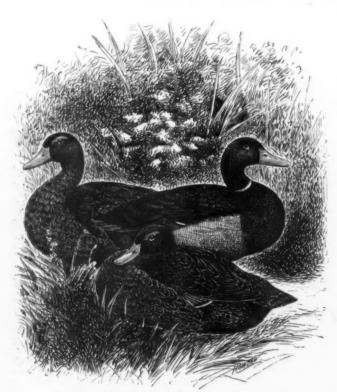


Fig. 4.-TRIO OF COLORED ROUEN DUCKS.

are bantams, and are bred more for the show room, and the Crested White are purely ornamental.

WHITE PEKIN DUCKS.

Of all ducks for farm and practical purposes none stands higher in popular esteem than the White Pekin. It is valuable to raise on a large scale, and the most

\*Abridged by Prof. John Michels, late U. S. Department of Agriculture.

These ducks receive their name from Aylesbury, the country town of Buckingham, in England. They are of large size. The male weighs from nine to ten pounds and the female seven or eight: birds weighing sixteen pounds to the pair are the average.

The head of the Aylesbury Duck.

The head of the Aylesbury duck is long and neatly modified from that of the wild Kallard, the body grown

long and heavier, with a tendency to drop down at the rear. The wings have lost the power of flight which their wild ancestors possessed. The plumage, however, remains almost the same.

The Rouen will be found a profitable bird to raise on the farm, a good market bird with delicate flesh, and

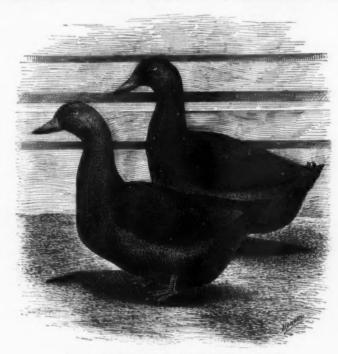


Fig. 5.—PAIR OF BLACK CAYUGA DUCKS.

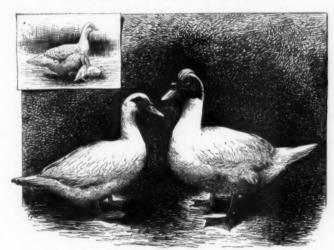


FIG. 6.-PAIR OF WHITE MUSCOVY DUCKS.

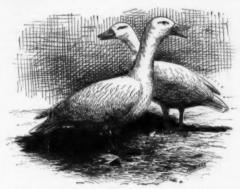


FIG. 7.—PAIR OF WHITE CALL DUCKS.

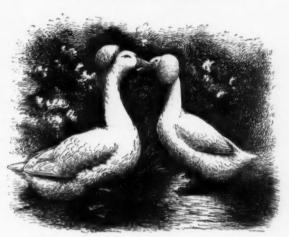


FIG. 8.-PAIR OF CRESTED WHITE DUCKS.



FIG. 9.-NEST OF WILD DUCK.

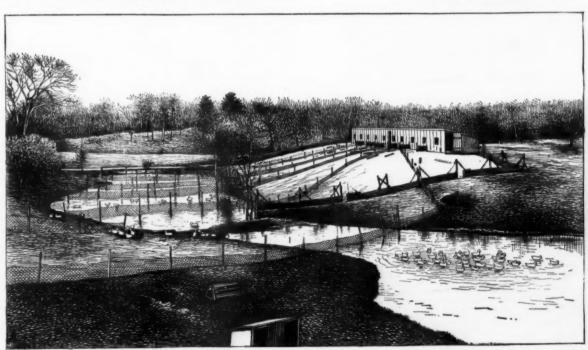


FIG. 10.-HOUSE FOR BREEDING DUCKS, SHOWING WATER RUNS.

easily fattened. The eggs are not large and of divers colors. The standard bred Ronen drake has a very finely formed head with rich, lustrous, green plumage, bill long and broad, of greenish-yellow color, black at the tip, the neek long and shorder and neatly curved, covered with the same real nustrous plumage. The Cayuga, first found in the central part of New York, of a drake is eight pounds.

## THE MUSCOVY DUCK

The white and colored Muscovy ducks form a distinct genus. They are found wild in the warmer parts of South America, and in Brazil are extensively domesticated and much prized. Wild Muscovies are easily frightened and very good fliers. They even fly into trees when alarmed and remain there. They also build nests in branches of trees and also in hollows near water. Muscovy ducks are very unsatisfactory birds to keep on the farm with other poultry, on account of their quarrelsome nature. In a wild state they flight desperately, and the domestic duck appears to inherit the quarrelsome disposition.

The head of the drake Muscovy is rather long and covered on the top with long, crestlike feathers, which rise and fall when the bird is alarmed. The face is the most distinctive part of these ducks, the cheeks being naked, with a scarlet fleshy space around the eyes. The white variety of Muscovy is a pure white throughout.

### THE CALL DUCK.

THE CALL DUCK.

The gray and white Call Ducks are bantams, and are brest more for fancy than for profit; and it is only a choice of plumage as to which is the better of the two. The gray call is very similar in color of plumage to the Rouen duck, and sometimes it is called the Bantam Rouen and the white is generally called the Bantam Pekin.

In beaching that the

Rouen and the winte is generally cause. Rouen and the winte is generally cause. In breeding Cail Ducks, smallness of size is the first consideration. The head is full and round, bill short and broad, and the body short, round and compact, with medium-sized wings, thighs short and the shank also. The gray call is a beautiful little bird, with rich, lustrous green head and neck, with a white ring on the lower part of the neck. The bill is greenish yellow color, the shanks, toes and webs are orange brown. The White Call is pure white in plumage throughout, and feathers of any other color will disqualify it.

## THE CRESTED WHITE DUCK.

THE CRESTED WHITE DUCK.

The Crested White Duck may be called an ornamental duck, much the same as Polish chickens. They are not bred to any extent in this country, seldom seen in the show rooms and have no especial value to the farmer. These ducks have a medium-sized head and bill and a large, well balanced crest upon the crown of the head. The shanks, toes and webs are of a bright orange color. The standard weight is about seven pounds. It is only within the past ten years that duck raising has developed into a flourishing industry. Prior to that time the duck was not considered a profitable fowl to raise, its flesh not being highly prized by the masses. Artificial incubation and brooding, combined with judicious feeding, have now, however, been instrumental in developing the industry. The season for raising ducks is six months—from February to July.

season for raising ducks is six months—from rebrail, to July.

The methods employed by successful farmers, the most approved buildings, appliances, feeding and care are all treated in detail in this bulletin. Mr. G. F. Howard claims that ducks can be successfully raised without water, except what is given them to drink, and it is stated there are plants where thousands of ducks are raised in this manner. But it is a matter in dispute, and some breeders use water and allow the ducks the full freedom of it, in which case the birds are prettier and have cleaner plumage.

### MODERN DISTILLATION OF WOOD. THE PRODUCTION OF ACETIC AC WOOD SPIRIT AND ACETONE IN PURE FORM.

WOOD SPIRIT AND ACETONE IN A PURE FORM.

NEAR (Chem. Ind., Jour. Sec. Chem. Ind.) states that although the primitive method of making charged by charring wood in heaps (Melier) is no longer continued to the carbonization being not continued to the state of the same time acetic acid, wood spirit, and acetone—the old process is still very generally worked in other countries where forest lands abound. Recently, however, efforts have been made everywhere to turn forest wealth to better account, and in this respect America has led the way by starting a large much ber of works for the carbonization of wood with special spirit. Russia is also making rapid progress in this direction. According to private information communicated to the author by Titschenko, the carbonization of wood is carried on almost exclusively, and in a most primitive manner, by Russian pessants in the governments of Welsk, Vologla and Archangel, in the crown forests, and the forests of the author by Titschenko, the carbonization of wood is carried on almost exclusively, and in a most primitive manner, by Russian pessants in the governments of Welsk, Vologla and Archangel, in the crown forests, and the forests of the author by Titschenko, the carbonization of wood is carried on almost exclusively, and in a most primitive manner, by Russian pessants in the government of the surface of the author by Titschenko, the carbonization of wood with special printing and the forests of the author by Titschenko, the carbonization of wood is carried on almost exclusively, and in a most primitive manner, by Russian pessants in the government of Welsk, Vologla and Archangel, in the crown forests, and the forests of the author by Titschenko, the carbonization of the partial development of the Russian text by winding to the production of the latter. Since the vield of acetic acid with a process in the production of a

waste, sawdust and the like. The carbonizing plant with horizontal retorts is the one generally adopted in Germany. The retort consists of a wrought iron eylindrical vessel, to the front end of which an iron charging door, working on hinges, is attached, the volatile products being carpied off by a pipe at the back. The size of the charges in twenty-four hours, the retort being capable of taking two billets lengthways. The charging a before do have been also bee

densed, while the gas and charcoal are utilized as fuel. The acetate of lime liquor is evaporated in copper pans. The pan is heated by a steam jacket and contains a set of stirrers to prevent the acetate from burning to the bottom. The tarry matter separated during this operation and after acidification with hydrochloric acid is removed through a sliding door, through which the progress of the operation is simultaneously watched. The acetate is then dried in suitable rooms heated with waste furnace or retort gases. During this operation the last traces of tarry substances are decomposed, a gray product remaining, which contains from 80 to 82 per cent. of calcium acetate.

The purification of crude spirit is effected by subjecting it to filtration through wood charcoal in a tower.

which contains from 80 to 82 per cent. of calcium acetate.

The purification of crude spirit is effected by subjecting it to filtration through wood charcoal in a tower. The object is to remove the greater part of the ketonestarry bodies and hydrocarbons, after which the rectification is proceeded with. This is performed in column stills in the presence of lime. The stills have a capacity ranging between 1,000 and 3,000 liters. The apparatus consists of a wrought iron or copper still, a copper condenser contained in a wrought iron water tank, a copper separator fitted with return pipe, a refrigerator provided with seal and the necessary steam and water fittings. To maintain a uniform pressure in the column, a manometer is used, in addition to which a thermometer is frequently employed to control the flow of spirit. The water used for cooling is introduced into the refrigerator at the bottom, and, having reached the requisite temperature, passes into the water tank containing the condenser, whence it either runs away or is pumped to the upper part of the column. The temperature of the water as it leaves the apparatus should be ascertained from time to time to determine whether it is that which experience has shown to give the best result.

The first distillate, known as first runnings, is al-

pumped to the upper part of the column. The temperature of the water as it leaves the apparatus should be ascertained from time to time to determine whether it is that which experience has shown to give the best result.

The first distillate, known as first runnings, is always more or less colored. The temperature is then carefully noted, together with the density of the distillate, and the receiver is changed as soon as the middle fraction, constituting spirit of the highest concentration, begins to distill over. After this, higher boiling products come over, their presence being first noticeable by the turbidity of the distillate produced when water is added to it. Subsequently the distillate interesing until, at the end of the distillation, water only distills over, impregnated with empyreumatic substances. The fraction from which water separates obly products is washed with water and the washings are added to the turbid distillate. The mixture is then redistilled in the next still with a fresh charge of crude spirit. The oily fractions are mixed together and redistilled separately, when a further quantity of middle fraction is obtained.

The treatment of wood tar for the production of creoste and graniacol is not practiced very largely by woodcoking establishments, most works being contented with its utilization as wagon grease or for the recovery of its products, it is treated with lime and subsequently dehydrated in stills having a steam jacket at the bottom. The fractionation is effected in cast iron tar stills of 1,000 liters capacity, heated by a direct fire. The first product is wood spirit, then acetic acid comes over. The distillate up to 150—known as light oils—has a specific gravity of about 101. Above this temperature the quantity of parafilm and gaseous products increases, and toward the end anthracene comes over. The residue in the still is wood tar pitch, and forms a considerable proportion of the original material. For the production of crososte, the light and heavy oils are mixed together an

Stove Polish.—The National Druggist recommend the following to a correspondent, with the remark the full it is used in France on the handsome ornamente trought iron stoves and heating apparatus:

Bayberry or vegetable wax. 8 parts.
Plumbago, in fine powder. 200 Mineral oil. 100 Coll of lavender.

ender.

Mix. If that does not suit your purpose, try the fol-

Dissolve the soap in the water, and add enough of the black lead to form a paste.

## ENGINEERING NOTES.

A new locomotive was recently tried on the Gothard Railway (Switzerland). It weighs 140 tons and is cap-able of traveling at a speed of 110 kilometers (69 miles) an hour.—Uhland's Wochenschrift.

For the compartment carriages of express trains on terman railways a heating system has been adopted which enables passengers to regulate the heat only 25 per cent., while any regulation beyond this limit is to be effected by the guard, on the outside of the carriage.—Uhland's Wochenschrift.

The condition of railways in Alsace-Lorraine seems to be very prosperous. Owing chiefly to the holding of an industrial exhibition at Strassburg, the receipts increased 141 per cent. in one year. The number of passengers increased 9 per cent. The number of passengers arriving at or leaving Strassburg (population 120, 000) was 2,673,218; at Mülhausen (population 80,000) the number was 2,625,649.—Uhland's Wochenschrift.

Some interesting facts are stated in Uhland's Wochen-schrift in connection with the plan of building a rail-way from Syria to India. It seems that quite a con-siderable traffic exists in Syria already, Aleppo being the siderable traffic exists in Syria already, Aleppo being the meeting point of several caravan routes. About 500,000 beasts of burden cross the Bailan Pass (between Aleppo and Alexandrette) every year. Fifty thousand camels are required for carrying to Alexandrette (the seaport) the annual supply of licorice for the United States.

the annual supply of licorice for the United States.

Acetylene gas, under a pressure of one atmosphere, does not explode when a spark is applied to it, neither does it explode under two atmospheres when a spark is applied, but under a pressure of three atmospheres there is a sharp explosion, the violence of which increases with the pressure, and we have the law: the rate of decomposition increases with the pressure. The above facts are the result of an examination of acetylene gas described by Prof. Mixter in an American scientific monthly. From this investigation it is concluded that when used with care acetylene is no more liable to explosion occur the result would doubtless be more disastrous.

In a recent issue The London Iron and Steel Trucks.

In a recent issue The London Iron and Steel Trades Journal says: "We learn from New York that there is a very large and steady export movement of tin scrap from the Atlantic coast to Europe. The amount of tin plate clippings made by the large tinware and can making factories in the United States is very considerable. Some of the more extensive works in this line put out from 50 to 190 tons of scrap tin monthly. This material, in most instances, is sold to exporters under a yearly contract. It is baled at the factory and shipped to Antwerp, from whence it is sent to a separating works in Holland, where, by a special process, the tin is recovered and made into pigs, while the steel scrap is sold for various purposes. The average value of the tin plate scrap, in bales, delivered at the dock in New York, is about 25 shillings per ton."

tin plate serap, in bales, delivered at the dock in New York, is about 25 shillings per ton."

Improvements on the Baltimore and Ohio Railroad, made since the property was placed in the hands of receivers, are described in the report for the year ending June 30, 1897, says Engineering News. The improvements include many new bridges capable of carrying the greatly increased engine and train loads, the arrangement of yards and terminals to facilitate the handling of freight trains, and the reduction of grades and curves at several points to enable heavier trains to be hauled at less expense. Besides all this, great amounts have been expended in lining tunnels, purchasing new rails and track material, double tracking, making additions to shops and stations, and large additions to the locomotive and rolling stock equipment. Its reduction of the grades and curvature between Baltimore and Cumberland, 192 miles, has enabled the train loads between these points to be increased at least 30 per cent. Across North Mountain, grades of 10 ft. per mile (equated for curves) have been substituted for grades of 42 ft. per mile, while 136° of curvature have been entirely eliminated. At another point, a series of reverse curves has been replaced by tangents and easy curves, while the objectionable "Seven Curves" have been replaced by long tangents and 3° curves. These improvements are, no doubt, a factor in the reduced cost of locomotive service, which was lower on nearly every division in spite of an increase in mileage, the cost being 15·72 ets. per mile run for 30,40,000 miles, as compared with 16·38 ets. per mile run for 29,203,000 miles in 1896.

In a paper read before the American Society of Civil Engineers respecting the working of soft steel for boil-

for 31,640,000 miles, as compared with 16°38 cts. per mile run for 39,203,000 miles in 1896.

In a paper read before the American Society of Civil Engineers respecting the working of soft steel for boilers, Mr. J. A. L. Waddell, the author, says: All structural metal work, whether of medium steel, soft steel or even wrought iron, should be punched at least ½ in. less than the diameter of the cold rivet, and reamed to a diameter ½ in. greater than same; and there is no bridge shop in existence which can turn out truly first class work without subpunching and reaming or drilling. Even when the greatest care is taken in punching the metal of the component pieces of long members, many of the rivet holes will fail to match by as much as ½ in., and the author has within a year or two seen ½ in. rivet holes elongated to 1½ in., merely to admit the rivets. Where several component pieces containing badly matched rivet holes are placed together and a tapered flexible reamer is used to enlarge the hole sufficiently to admit the rivet, the latter cannot possibly fill completely the irregular hole, and, therefore, if left in the piece, cannot act effectively. If condemned by the inspector on account of looseness, and then driven out, it will, on account of looseness, and then driven out, it will, on account of the crookedness, materially injure the metal about the hole, and thus weaken the structure, perhaps doing more damage thereto than would the leaving in of the loose rivet. The use of the tapered, flexibly connected reamer is all humbug, and is not true reaming at all, but merely a means of making it practicable to get the rivets through badly punched holes that assemble irregularly. Real reaming can only be done with rigid reamers or drills that remain at all times at right angles to the surface reamed, and cut a cylindrical instead of a tapered hole. Such reamers as these are the only ones that ought to be employed on first class metal work, excepting, of course, in confined spaces where they cannot be used and where

### MISCELLANEOUS NOTES.

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Paris police statistics just published effectually prove that murder does not pay, from a financial point of view. They enumerate twenty-one murders, by which the assassins averaged \$16, and all the criminals were guillotined. The statistics also cite cases of over one hundred more or less famous murders yielding in many cases but a few cents. The biggest haul was \$65, although in many cases large sums were overlooked.

though in many cases large sums were overlooked.

Some idea of the loss to the Lake Keuka grape region from the recent freeze can be obtained from the following figures given by the Hammondsport Herald: There are estimated to be 15,000 acres of vineyard in the entire region. Estimating this year's yield at two tons to the acre would give a total of 30,000 tons. Assuming that the average price per ton for Concord, Delaware, Catawba and other varieties would have been \$20, had they not frozen, the entire crop would have been worth \$600,000. Assuming, again, that the freeze damaged the total crop \$5 per ton, the loss would be \$150,000.

would be \$150,000.

J. M. Hodnet, a progressive farmer living near Lilac, on the dividing line between Milam and Williamson Counties, Texas, says that the Chinese tea plant grows luxuriantly on his farm, even in the fence corners, and requires no cultivation, save being kept free from weeds. The plants come up voluntarily every year, spread rapidly, and by the uninitiated would often be mistaken for noxious weeds. As an experiment, Mr. Hodnet imported the seed several years ago from Oriental China through our ambassador. He now gathers the leaves, dries and uses them in making a most palatable tea, almost, if not quite, equal to the imported product.

The facts gleaned from the report of the Internal Revenue Department give some rather surprising figures as to the extent of the tobacco manufacturing business of this country, says The New York Times. During the year covered by the report there were manufactured 4,048,463,306 cigars, from 75,938,866 pounds of cigar leaf; 4,967,444,232 cigarettes, 153,397,907 pounds of plug tobacco, 11,761,690 pounds of fine cut chewing tobacco, 83,548,984 pounds of smoking tobacco, and 12,708,919 pounds of smuff. In all, 261,417,590 pounds of tobacco were manufactured, from 213,-345,537 pounds of leaf, 16,375,883 pounds of scrap, 4,840,494 pounds of stems, 30,972,213 pounds of licorice, 23,391,757 pounds of sugar, and 15,408,107 pounds of other materials, making a total of 416,567,733 pounds. The facts gleaned from the report of the Internal

cher materials, making a total of 446,587,735 pounds of other materials, making a total of 446,587,735 pounds.

A process for spraying cloth with dye liquor for producing ornamental effects has been brought forward by W. Grimshaw, a manufacturing chemist of Manchester, England. The arrangement is characterized by entire simplicity, a revolving or reciprocating brush being so adjusted in the machine that a bar catches its bristles or wires momentarily, and when these are released they dash the colors onto the fabric. In practice, troughs are employed containing the colors, to each trough being fitted a brush in conjunction with a bar or roller. The fabric or material to be ornamented is so guided as to travel over or in front of the brushes, these being mounted so that their bristles come in contact with the color and carry some of it forward until they momentarily catch against the stationary bar or roller, and as soon as released spray the colors onto the fabric in the form of a colored rain. The fabric may be printed in an ordinary printing machine, either after or before the spraying operation, and with any suitable pattern.

chine, either after or before the spraying operation and with any suitable pattern.

The largest fruit plantations in the world are in Jamaica. They are owned and operated by an American company, the area of whose fruit farm is 44,000 acres. They own 28,000 acres and the other 16,000 acres are held by them under lease. Their principal crops are bananas and cocoanuts, and last year they shipped 3,000,000 bunches of bananas and 5,000,000 cocoanuts, besides other fruits, to America and elsewhere, employing twelve steamers belonging to the company. Near Olden, on the Ozark Mountains, in southern Missouri, there is one of the largest and finest fruit farms in the world. It consists of 2,200 acres of land, owned by a syndicate formed of the members of the Missouri Horticultural Society, and on which are planted 61,000 peach, 23,000 apple and 2,000 pear trees, with 40 acres in small fruits. There is an orchard at Santa Barbara, in California, belonging to Elwood Cooper, of an area of 1,700 acres, containing 10,000 olive trees, 3,000 English walnut trees, 4,500 Japanese persimmon trees, 10,000 almond trees and about 4,000 other nut and fruit trees.—Buffalo Evening Times.

persimmon trees, 10,000 almond trees and about 4,000 other nut and fruit trees.—Buffalo Evening Times.

The canning industry has made such vast strides all over the world, and notably in America, that this method of preserving foods has formed the subject of inquiry at the hands of the bacteriologist. As in Baltimore alone 1,250,000 bushels of oysters are annually canned, and the United States is responsible for 120,000,000 cans of tomatoes, and of other articles, such as fish of various kinds, fruits, etc., in similarly large numbors, it is remarkable that Messrs. Prescott and Underwood's paper, "Micro-organisms and Sterilizing Processes in the Canning Industry," published in The Technology Quarterly, should be the first contribution to so important a subject. These gentlemen have specially studied the bacterial flora of canned clams and lobsters which have broken down, or, in other words, been imperfectly preserved. In every case where "spoiling" had occurred, bacteria were present in large numbers, while in no instance were any discovered in sound cans. Sometimes only a single variety, or a pure culture of a particular microbe, was found in unsound cans, but usually the latter contained a mixture of several species. Nine different bacteria were selected and isolated for subsequent study, both as regards their macroscopic and microscopic appearances; two of these were coci, the remainder bacilli forms. These bacteria were afterward inoculated into the contents of sound cans, with the result that the latter invariably decomposed. Experiments were also made to test the method of applying heat to canned articles which would most effectually destroy the chances of these micro-organisms surviving and spoiling the contents. Their investigations go to show that, given a proper control of the temperature, it is possible to preserve clams and lobsters with absolute certainty and in a more perfect condition than has hitherto been possible.

## SELECTED FORMULÆ.

Solution for Gilding Brass and Copper.—The following formula has been adopted for water gilding, as it is termed. Fine gold, 6¼ dwts. Convert the gold into chloride and dissolve in 1 quart of distilled water, then add 1 pound bicarbonate of potassium and boil the mixture for two hours. Immerse the articles to be gilded in the warm solution for a few seconds up to one minute, according to the activity of the bath.

Lead Arsenate -- Potato Bug Destrover .-- A new Lead Arsenate—Potato Bug Destroyer.—A new Canadian insect (potato bug) destroyer is prepared by dissolving 3 ounces of sodium arsenate and 4½ ounces of lead acetate, each in a quart of water; these are poured into a vat containing 45 gallons of water, the mixture thoroughly stirred and water added to make 50 gallons in all. A slight excess of lead acetate remains in the solution; if the sodium arsenate were in excess, the plants would suffer. The precipitation is carried on in a very dilute solution, in order to obtain the precipitate in as finely suspended a condition as possible, so as to facilitate its distribution over the plants.—Pharmaceutical Era.

Paint for Copper.—To preserve copper from oxida-ion a varnish is recommended consisting of :

Bisulphie	de of	ca	rt	ю	n			0 .		0	٥		0			1	DAT
Turpenti	ine						(6)					*		e	9.	3	1.6
Benzin													0	0		1	64
Methylai	ed st	piri	t.							0				0		2	8.6
Hard cor																	66

This gives a very permanent varnish, and if several oats are used, preserves the copper absolutely.

### Putz Polisher .-

Oxalie acid	1	art.
Iron oxide	25	K 80
Rottenstone		44
Palm oil.		6.6
Liquid petrolatum		6.6

The iron oxide may be replaced by Venetian red. Both it and the rottenstone must be absolutely free from gritty particles.—Montreal Pharmaceutical Journal.

Powder for Tender Feet.—As an application in this ondition the following is recommended by Hagar:

Dried alun	1											1	drachm.
Salicylic ac	id					е.	٠,					16	**
Wheat star													6.6
Powdered													ounces.
rm 1 11	1			0. X					,			3.0	A 1 This

To be applied as a dusting powder.—Montreal Pharaceutical Journal.

### Varnish for Steel (Dress Swords etc.)-

			Weight,
Gum sandarac			15
Small mastic	 		10
Elemi			5
Camphor			3

Dissolve the whole over the water bath in sufficient alcohol for the purpose. This varnish is used cold. It preserves the blade from rust, and is transparent.—Montreal Pharmaceutical Journal.

Baking	pow	der						0		a	0	0	0	 1	pai	rt.
Rice flo	ur.		 	*	6 6			٠						 9		

Previous to mixing, color the rice flour with a solu-ion of aniline orange to a dark egg yolk tint; dry, hen mix with the baking powder.—Montreal Pharma-ceutical Journal.

## Custard Powder. -

Corn flour	
Arrowroot	8 "
Oil of almond	20 drops.
Oil of nutmegs	10 "
Tineture of seffron to color	

The tincture of sairon to color.

Mix the tincture with a little of the mixed flours; then add the essential oils and make into a paste; dry this until it can be reduced to a powder, and then mix all the ingredients by sifting several times through a fine hair sieve.—Montreal Pharmaceutical Journal.

## Dressing for Tan Shoes.—

(1)	Annatt	0																			1	ounce.
	Gambo	ge.												0				۰		0	1	0.6
	Acacia																				1	4.0
	Catechi	1.									0	0					۰	0	0		2	
	Hydroc	hlo	ri	e	E),(	ei	d	L.													2	66.
	Water,	ene	ou	g	h	1	10	,	11	ai	a	k	e								40	1.0

Rub the annatto and gamboge with the acid and a portion of the water, and add this to the remainder of the water, with which has been incorporated the catechu

(2)	Oil of turpentine		×	è		 6.		÷	3	ounces.
	Dark yellow wax	× -			*				1	6.6.
	Palm oil								1	4.0
	Oil of mirbane								15	minims.
(3)	Yellow wax								6	ounces.
377	Linseed oil					 0			10	44
	Spirits of turpentine						2		30	4.6

Dissolve in a closed vessel by means of a water bath,

. . . . . . . . . 4 ounces Soap..... previously dissolved in Water.

Water...... 2 pints.
Stir until cold. With each ounce of the cream thus obtained mix thoroughly Nankin brown...... 5 grains

Rectified spirit. ...... ½ drachm

The resulting polish is applied to the leather with ag, allowed to dry, and then lightly polished with oft cloth.—Pharmaceutical Era.

Liquid Pomads.—White wax 30 parts, olive oil 450 parts, are fused together and perfumed with 25 parts of oil of bergamot, 15 parts of oil of clove and 5 parts of oil of lavender.

On of lavender.

Permanent Paste for Paper Hangers.—Dissolve or onnee of alun: in one quart of warm soft water. Whe cold add flour to make it about the consistency cream, then add half thimble of resin and half oun of sugar of lead. The above are the proportions for bucket of paste.

THE RUINS AND EXCAVATIONS OF ANCIENT ROME.

There has recently been issued from the Riverside Press of Messrs, Houghton, Mifflin & Company, Cambridge, a most valuable handbook on the archeology of Rome, entitled "The Ruins and Excavations of Ancient Rome." The Ruins and Excavations of Ancient Rome." The author, Rodolfo Lanciani, D.C. L., L., D.L., is known to English-speaking readers chiefly as a lecturer and as the author of two popular books on ancient Rome. But is known to archeologists as the author of innumerable books, papers and pamphlets on Rome. His new volume is a systematic treatise which will prove of the greatest value when used in Europe, except London.

Prof. Lanciani's remarks about the Tiber are very interesting. He states that, according to Ceselli's observations, in 1871-72, the daily outflow is 1,296,000 cubic meters (285,000,000 gallons). During the same year, 8,582,333 tons of sand and mud were washed down to the sea. Of course, this enormous mass of detritus causes the sea-coast to advance westerly at a considerable rate. The Torre di S. Michele, built in 1597, ancient Rome. His new volume is a systematic treatise while will prove of the greatest value when used in Europe, except London.

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The inundations are the great historical features of the Tiber, and, according to Prof. Lanciani, 133 inundations are recorded, the worst being that of December, 1598, when the water rose 54 feet. The last flood, in December, 1870, resulted in the construction of the

water as they could get from the Tiber, from wells and from springs." In later times the aqueducts brought an abundant supply of water to Rome, and these aqueducts, or rather the remains of them, are still one of the wonders of the ancient world. The first aqueduct, the Aqua Appia, dates from 312 B. C. The second aqueduct was begun in 272 B. C. The Marcian aqueduct, which dates from 144 B. C., is a magnificent piece of work, the engineers alternating bridges and tunnels.

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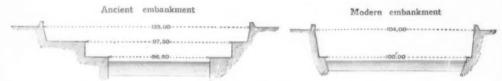
An excellent example of the skill which the Romanspossessed as hydraulic engineers is the union of the seven aqueducts at the Porta Maggiore, which we reproduce from Prof. Lanciani's book. At this point the aqueducts are carried on each others' backs, the Alexandrina, Anio Vetus and Appia running underground, while above were the Claudia, Anio Novus, the Marcia, Tepula, Felice and Julia, seven of the channels being above ground. It was possible by a union of waters from different parts of the surrounding country to vary the temperature of the water so that it could be delivered at the proper degree of coldness for drinking. All of the aqueducts did not bring good water to the city. The Aqua Alsietiva was an unwholesome water and was possibly used for navalshow fights. A rule was strictly followed under the empire that no one should be allowed to build and open baths for public use unless a special supply of water was secured at the same time. At the time of Constantine there were in Rome 11 great therme, 926 public baths, 1,212 public fountains, 247 reservoirs, without speaking of private houses, of public and private gardens, etc.

Supposing the inhabitants of Rome suburbs included to number one million, there was a daily water supply of 1,590 liters (396 gallons) per head. In modern Rome, with a population of half a million, there are about 750 liters (167 gallons) per head. The volume of water which supplied Rome may be estimated by comparison with the Tiber, which discharges 1,296,000 cubic meters per day, while the old aqueducts carried not less than 1,747,311 cubic meters. Prof. Lanciani gives a very instructive table of the supply of water in ancient and modern Rome. The fourteen aqueducts of ancient Rome were 508,631 meters long and discharged 1,747,311 cubic meters (394,000,000 gallons) a day, while those of modern Rome—four in number—are only 158,639 meters long and bring only 379,080

"Burial of Rome," that interesting chapter dealing with the setting up as it were of old Rome to preserve it to our day.

In our brief review we have glanced at subjects which are treated in the first hundred pages of this fascinating book, and here we must take leave of our author, though we have not been able to touch upon the wonderful discoveries which have been recently made, often through Prof. Lanciani's initiative. Each ruin of ancient Rome is described by this great archaeologist in the light of modern exploration, and the student who would look farther is referred to the proper authorities by hundreds of bibliographies, and he will have the satisfaction of knowing that the books recommended are of actual value; nothing is cheaper than a bibliography, but critical selective bibliographies like those in the present book are rare.

After reading "Ruins and Excavations" the student will anxiously await any new demolitions, and he will know the excavations will be carefully watched by such men as Dr. Lanciani, who will record the finds for the benefit of the future student of the archæology of Rome.



ANCIENT AND MODERN EMBANKMENTS OF THE TIBER, AT ROME.

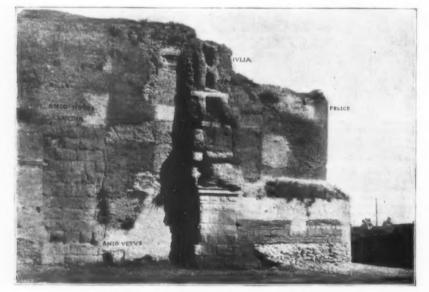
position among the serious archæologists, he has had the best possible opportunities for making observations. Most of the ruins have been examined and measured inch by inch by the painstaking professor, and luckily his photographs, drawings and measurements were in many cases taken before or during the progress of the demolitions which have done so much to injure the beauty of the old city. Building speculation, which had run riot in Rome, has at least resulted in the discovery of many interesting things which would otherwise have remained hidden.

Before considering the book, another work which occupied our author many years may be referred to. This is the "Forma Urbis Rome," an archeological map of the city published in forty-six sheets, on a scale 11,000, and published under the auspices of the Royal Academy del Lincei. This work, of which twenty-four sheets have been issued, reflects the greatest possible credit on Prof. Lanciani.

The present work is illustrated by half-tone engravings, usually from unique negatives. The author has adopted neither the chronological, the topographical nor the architectural system, but used a wise combination of them which renders his book very usable. Although in a certain sense a guide book, it differs from most manuas in being written by a man of independent learning, and in no place do we detect the hand of the compiler.

We will glance at some of the interesting points brings forward an important fact in stating that the site of Rome was like that of Veil and Faleria, with marvo dales inclosed by crazgy cilffs. Of course, modern civilization, and even that of earlier times, has done numel to change the aspect by planing down hills, filling up valleys and leveling off the sharp edges of eliffs.

The Romans did not deny the unhealthmess of the esteron of iron objects. The modern division of iron objects. The good condition, with the exception of iron objects. The good condition, with the exception of iron objects. The good condition, with the exception of iron objects. Th



THE SEVEN AQUEDUCTS AT THE PORTA MAGGIORE.

district in which the city was built. The hills were comparatively healthy; still, the ravages of malaria, increased by ignorance of sanitary rules, were consid-erable. The summer "villeggiatura" was as well es-tablished among the old inhabitants as among the

tablished almong the old limboliants as almong the moderns.

The sanitary reforms were wonderful. The Romans drained the marshes and ponds, built costly sewers, and conveyed immense supplies of pure water to the city by means of splendid aqueducts. Roads were paved and multiplied, sanitary engineering was applied to houses, and cremation was substituted for burial. The results were wonderful, and the death rate was much decreased.

The barbarians cut the aqueducts, the drains became choked, and once more there was a revival of malaria;

choked, and once more there was a revival of malaria; "For but now the present generation has again driven away tinus,

## THE PYGMIES.

THE PYGMIES.

The pygmies, of whom the poet of the Iliad speaks in his story of their wars with storks, are no longer to be classified among myths.

Never before did the antique literature of Greece receive a more brilliant triumph. The impulsion was given. The learned men set to work to find out everything about those dwarfs, whose existence Stanley revealed. The pygmies, who were interesting only to a small number of professional anthropologists, have now become interesting to all. The Wambouttis, whom the celebrated explorer of the mysterious regions of the dark continent encountered on the shores of the Arouhonimi, are evidently the brothers of the Accas, of the Batouas, who live in the shadows of the Mountains of the Moon, and even of the Bushmen of the Cape Colony. The latter, by intermingling with other tribes, have added something to their stature. It is not wonderful to find members of a family for ages disseminated in many regions of Africa; a far more curious thing is the discovery of their cousins in other portions of the earth.

The pygmies are represented to day only by a small.

The pygmies are represented to-day only by a small number of tribes in Africa, threatened with early extermination, and by 2,220 Weddas of the island of Ceylon, whom the British government is about to destroy under the pretext of the benefits of civilization. These dwarfs were the advance guard of the human race. They were the first inhabitants of India. They occupied all Africa from the Cape of Good Hope to Sahara, and finally we find them during the stone age in the center of Europe, where they lived probably before the arrival of the men of tall stature, who annihilated them.

AQUEDUCTS AT THE PORTA MAGGIORE.

The bills were types of malaria, les, were considerable length. The Romans ilt costly sewers, the Romans ilt costly sewers, the Romans to the sewers. Against this great danger there were only the sewers. Against this great danger there were only the sewers, the Romans to the effluvia of the sewers. Against this great danger there were only the sewers applied tuted for burial, death rate was are defined and the hilly nature of the city ground, which allowed them to give the drains became ival of malaria; and driven away if the Romans contented themselves with such in the Romans on the ratio of the length and the mile grandeur. The Missionary Review from its old time grandeur. The Missionary Review asys that in 1893 the Rev. Dr. A. C. Good, while out on an exploring expedition at the east of Batanza, not far from the German colony of Cameroons, found on an exploring expedition at the east of Batanza, not far from the German colony of Cameroons, found on an exploring expedition at the east of Batanza, not far from the German colony of Cameroons, found on an exploring expedition at the east of Batanza, not far from the German colony of Cameroons, found on an exploring expedition at the east of Batanza, not far from the German colony of Cameroons, found on far from the German colony of Cameroons, found on an exploring expedition at the east of Batanza, not far from the German colony of Cameroons, found on an exploring expedition at the east of Batanza, not far from the German colony of Cameroons, found on an exploring expedition at the east of Batanza, not far from the German colony of Cameroons, found on an exploring expedition at the east of Batanza, not far from the German colony of Cameroons, found on the way a village of dwarfs. According to the leading or an opporation the far.

According the mutual

they simply change their masters. The Presbyterian missionaries of Cameroons, thanks to the confidence which they have been able to inspire among the pygmics of western Africa, have been able to add immensely to the rather superficial investigations of Stanley. The Rev. Dr. Gillespie, in The Missionary Review of the World, says that they live in ingeniously constructed huts made of logs and leaves, and that they lead a nomadic life. They never cultivate the soil, and their food supply is furnished by hunting. Whenever they have an opportunity they will willingly exchange their game for the vegetables and fruits which are brought to them by other tribes.

In reality, these dwarfs, that one might be inclined to look upon as monkeys of the most dangerous type, have a commercial instinct. That is the commencement of civilization. The missionaries of the western coast of Africa have discovered that the dwarfs are able to carry on a conversation and to treat certain questions in an intelligent manner, when they are not paralyzed by the fear with which white men inspire them. The young pygmies who are at present in the Presbyterian mission school established among the Mabeyas show considerable aptitude for acquiring knowledge. Sometimes it seems that they have a language of their own, but in general they speak the language of the race of which they are the protégés. The question of the language of the pygmies of Africa is in teresting. Ernst Haeckel tells us in his interesting paper upon the Weddas that the different tribes of dwarfs in the island of Ceylon do not understand each other. Two families living a few hundred meters apart have not the same words for trees, mountains, bows and arrows. In short, among this primitive race there are almost as many languages as individuals. If the same diversity is found in the vocabulary of the dwarfs of Africa, it is easy to understand why they adopt the language of the tribes from which they solicit protection. Unfortunately, the pygmies of the dark continent have not yet lad

the Weddas; but they are superior to the former in intelligence. The dwarfs of Ceylon, who might from many points of view serve as models for more civilized people, are not remarkable for their intelligence. It is impossible to teach them to count up to three, and all attempts to convert them to Christianity have failed completely, because the existence of a superior being and the distinction between the soul and the body are ideas which go far beyond the power of their minds. Out of the 2,220 Weddas in the island of Ceylon there is only one single Christian. No doubt we must allow for the illusions of the missionaries, but nevertheless we must admit that the pygmies of Africa appear to have some religious instinct and to believe in the existence of a supreme being, of whose attributes and nature they have only a very vague idea. The German missionary, Dr. Krapf, speaks of the belief among the tribe of dwarfs in the existence of a supreme being whom they call Zer. Here is the form of one of their curious prayers, which they offer up in moments of distress: "If you exist, why do you permit us to be massacred? We do not ask you to furnish us with food. We can content ourselves with ants and snakes and rats. If you have created us, why do you permit us to be annihilated?"—G. Labadie-Lagrave, in the Paris Figaro.

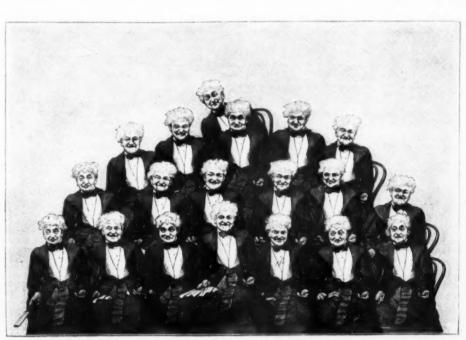
## THE TRUE EXPRESSION OF THE PHYSIOGNOMY

PHYSIOGNOMY.

I HAVE already shown that the application of chronophotographic analysis to the study of the motions of the lips of a person talking is destined to render to the study of the physiognomy in motion the same services as those that it has afforded in the analysis of the most delicate muscular acts.

There is here a field of investigation of the vastest extent and a work that interests the artist and the scientist much more than does the cinematographic reproduction of motion.

The expressions of the physiognomy are fixed and mobile, and those that are fixed (such as calm expressions)



CHRONOPHOTOGRAPH OF THE FACIAL EXPRESSIONS OF AN AGED LADY.

The Presbyterian missionaries of the Cameroons country have not yet had time to study thoroughly the language of the dwarfs. The only prominent trait in their character which they have discovered is a passion for music. Mr. Roberts, according to The Missionary Review, was present at a concert given by pygmies. A stick about an inch and a half in diameter was placed upon the ground to serve as a piano. Two women, bodding in each hand a wand struck this radiumentary. Review, was present at a concert given by pygmies. A stick about an inch and a half in diameter was placed upon the ground to serve as a piano. Two women, holding in each hand a wand, struck this rudimentary instrument as vigorously as they could. A large piece of wood hollowed at the top and covered by a deerskin served for a drum, and a metal instrument in the form of those bells that the European mountaineers attach to the necks of their cows was used as a cymbal. The women who had no instrument to play in this orchestra sang and beat time with their hands. It may be that the pygmies of the west, under the hard rule of the Mabeyas, have become timid, and no longer make use of the poisoned arrows which the Wambouttis shoot with extraordinary accuracy. Perhaps also the illustrious explorer, who was inspired by the traditions of Pizarro and Fernando Cortez, rather than by the example of Livingstone, could not resist the temptation of painting all the inhabitants of the dark continent in as dark colors as possible, without distinction of stature or tribe. There must be some exaggeration in the story of Stanley, but it is none the less certain that the pygmies of Africa are far from being like their cousins of the island of Ceylon, models of all human virtue.

"The Weddas," says M. Ernst Haeckel, "are friendly, inoffensive, goodhearted, liberty loving, detesters of falsehood, respecters of the property of others and very hospitable. They have also a sentiment of honor. They fight with courage and die without regret. They live under a régime of strict monogamy and punish by death all infractions of the conjugal faith, which infractions are extremely rare. Robbery, infanticide and murder are almost unknown among them. The African py mies are not remarkable for their domestic virtues, not the ray propound respect for the property of others, or that hospitality which distinguishes

sions) may be easily caught by the camera, and portrait photographers seek for them above all else.

Mobile expressions are such as accompany the passions and emotions of all kinds. They form an infinite gamut of snades that separate joy from anger and pleasure from suffering.

It must not be supposed that these true expressions can be caused and reproduced voluntarily. The anger or the joy of the actor is merely a grimace which has nothing of real.

Such expressions are exaggerated and should be, since the theater demands and even exacts them. They are assumed in order to be observed, like the scenery, from a distance. The spectator in front of the stage does not have the illusion sought. Things theatrical must be seen from the view point for which they were created. The nearer one approaches them, the more the effect vanishes.

vanishes.

The expressions of the actor's face differ, therefore, from true ones. The actor cannot possess the moral state of the person whom he represents. It is in vain for him to try to be such person, for he can succeed therein but imperfectly. There are, moreover, emotions that cannot be renewed—the agony of death, for example.

tions that cannot be renewed—the agony of death, for example.

As the psychical state is not the same, the central excitations differ, and the diffusion of such excitations in the muscles must forcedly differ also, and the muscular synergies that constitute the expression are finally false.

These muscular synergies do not locate themselves in the muscles of the face solely, but embrace the entire body. The general attitude and the gesture are as expressive as the face.

But, through an artificial education, it is possible to derange these synergetic associations, or at least to antagonize them. It is possible to destroy the concordance that should exist between them, and we then obtain a false physiognomy that expresses nothing and that is particularly disagreeable to look at.

Since the popularization of the cinematograph a new

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industry has been created, that of manufacturing strips serving for animate projection.

Since the operators have merely a commercial object in view, they have thought it proper to combine seenes in front of their apparatus rather than go to seek them in nature.

Aside from the discredit that such compositions necessarily cast upon a new art, it is undeniable that these scenes are grotesque and the motions therein false and precipitate. One feels that the improvised actors have been hunted up by the experimenter and have occupied themselves especially with making as many gesticulations as possible within the space of fifty or sixty seconds that is accorded to them, and that represents the time of the passage of the strip through the apparatus.

atus.

The least natural act (children playing freely or gossips indulging in some tittle-tattle before their door would prove of much greater interest than these eccentric compositions, in which there is nothing real and in which everything has been badly regulated in account.

in which everything has been badly regulated in advance.

Photography has one merit that no one disputes it, and that is authenticity. It must not be discredited by giving it false documents to reproduce and be made to lie by obliging it to perpetuate errors.

The same is the case with the subject who wishes to be photographed. Is he not a momentary actor and an awkward one when he posses before the objective? So what a poor result is obtained by this means!

Nervous, expressive persons should give up the idea of having a passable portrait taken, and yet, on the contrary, photography ought to seize the most subtile shades of their expressions of the face, we meet with what might be called final and transitional forms. As in the acts of locomotion, the eye seizes the final forms, but is absolutely blind as regards the forms of transition.

but is absolutely blind as regards the forms of transition.

For example, we see the leg of a runner in the positions corresponding to dead centers, that is to say, to changes of direction in speed; but we perceive only a haze in the attitudes of transition—during the lifting of the foot, for example. This impression is given by the photographic apparatus itself, when it is provided with a shutter that is not very rapid.

In the motions of the face the final forms are often of very short duration. In lively expressions they are often greatly exaggerated; but when it is a question of simple expressions, like those of conversation, all the forms of transition disclosed by chronophotographic analysis are very intelligible and have the appearance of life.

lorms of transition disclosed by chronophotographic analysis are very intelligible and have the appearance of life.

At all events, no face can be posed for an expression of transition any more than a man can be who is running a race. It is ignorance in such matters that causes work of pure convention to be accepted.

We close in saying that the expressions of the face in motion can be seized by chronophotography only. It is necessary, too, that the subject studied shall not be forewarned and that he shall not be influenced in any manner. It is on such conditions only that photographic documents will have any value. So researches of this kind are particularly lengthy and uncertain.

We long ago began studies upon this subject. At present we give, merely as an example, an analysis of the expression of an aged lady who proved a failure before all the objectives of ordinary cameras because of the extreme mobility of her face.

We photographed her, unbeknown to herself, while she was conversing with us. The images were taken in the shade at the rate of fifteen to the second.

In the analysis thus obtained it is possible to follow the origin of the most varied expressions. We dissociated the negatives and composed a group that permits of better comparing these images one with another. This is a new manner of presenting the living portrait, Let us add that such negatives can be taken with the greatest ease after one has provided himself with a chronophotographic apparatus that gives large images.

G. Demeny, in La Nature.

## THE ORIENTATION OF GREEK TEMPLES.\*

The Orientation of Greek Temples.\*

In giving an account of my second series of observations on the orientations of Greek temples, and the chronological deductions which may be made from them, it seems desirable to recapitulate as briefly as possible the main points which underlie the inquiry.

The subject was introduced to me about eight years ago by Sir Norman Lockyer, who had discovered that there was a very strong probability that in every case the axis of an Egyptian temple, or in other words, its orientation, was aligned to that point of the local horizon where at the time of its foundation some conspicuous star rose or set, and that in the case of temples oriented within zodiacal limits it was also so arranged that on the day of the principal feast of any particular temple, which always took place on a day when the sun at its rising would shine upon the altar or statue of the god, the star should be seen from the sanetuary, through the always narrow eastern opening, shortly before sunrise.

There is plenty of evidence from various sources that heliacal stars, as they are called, that is, stars when just visible at their rising before their light is overpowered by the rays of the rising sun, or setting while still distinguishable, were very much observed by the ancients. And the use of an heliacal star so observed in connection with temple worship was to give warning to the priests to enable them to be ready for the sacrifice or other function at the exact moment of sunrise. Roughly speaking, a bright heliacal star would in Greece give nearly an hour's warning of the sun's approach, though somewhat less in Egypt.

If in almost every case a connection, such as I have indicated, between the orientation of a temple and the sunrise effect in the sanctuary, preceded by an heliacal star, can be established, it earries an amount of probability of the truth of the theory which it is very hard to gainsay.

To us the practical use of such theory is that it gives the means of determining very approximately the date

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Abstract from Nature of a paper rech 11, 1867. On the Orientation of coes of their Foundation, derived from As ing a supplement to a paper on the same subject published in the Trations of the Royal Society in 1896-by F. C. Fenrose, F.R.S.

cf the foundation of any temple, namely, the time when the sunstained and the heliacal star were so connected.

As seen from a given point at its rising or setting, the amplitude of a star (that is, its bearing from true east or west) is subject, as time goes on, to a slow alteration resulting from the displacement of the star, in consequence of the celestial movement called the procession of the sun at the heliacal phase, if it may receive that attempts had been made to retain the sanetuary of a temple. There is architectural evidence in Egypt that attempts had been made to retain the use of such stars, and in two ways: one by a structural attention in the eastern opening, so as still to allow of its being seen; and the other as evidenced by finding that a temple, architecturally of later date, but of the same cult, had been built alongside of an older temple which had lost the star which had at one time served as its morning clock.

Sir Norman Lockyer having been satisfied that the principles of temple building, as above mentioned, had prevailed in Egypt, and being led by a cursory examination of Greek examples to suspect that the same would be found to prevail in that country also, invited me to take up this inquiry with respect to Greek temples, which led to my making a preliminary communication to the Society of Antiquaries in 1891, and a more detailed report to the Royal Society in 1893, of which an abstract appeared in Nature, May 11, of that year. The paper jusel was published in the Transactions of the Royal Society (vol. 184, pp. 805 et seq.), to which the supplement, already referred to, was published in vol. 190, pp. 43 et seq. The first series contains more than thirty examples, the second hearly as namy, and both collections entirely confirm the view of the material relay made bighly probable from Egyptian sources. Indeed, the second series, chiefly drawn from colonial Greece, is in one respect more satisfactory than the previous one.

The architectural remains of the greater number of the temples

colonial Greece, is in one respect more satisfactory than the previous one.

The architectural remains of the greater number of the temples in Greece proper, comprised in the first list, do not accord with the early dates derived by calculation from their orientations; and it is necessary to assume that in the majority of cases a temple, of which we find the ruins, was built parallel to the lines of an earlier structure which had, conformed to the orientation postulate, and the date arrived at is that of the first foundation on the site. Traces of such earlier foundation can, however, be actually found or inferred in a sufficiently large proportion of the whole to justify the assumption; but in more than half the cases they have either disappeared or not yet been found. In the colonial examples of the last series, however, quite two-thirds of the orientation dates are consistent with the architectural remains now standing, without need of any hypothesis respecting foundations as yet undiscovered.

All the temples I have not with in Magna Greeia or

thirds of the orientation dates are consistent with the architectural remains now standing, without need of any hypothesis respecting foundations as yet undiscovered.

All the temples I have met with in Magna Grecia or Sicily are what may be named solar temples; namely, those which admit of being lighted through an eastern door by the sun when rising in the line of the axis. Three of them, indeed, lie on the solstitial limits; of this I did not find any examples in Greece. The nature of the inquiry in a solar temple is of this kind, viz.: given the angle of orientation, and the apparent height of the eastern horizon, we calculate the declination which the sun would have required to illuminate the sanctuary at its rising (allowance being made for the variation of the obliquity of the ecliptic many years ago, an allowance which may require a small correction when an approximate date has been arrived at). From this the sun's right ascension is computed, giving generally two values—one vernal, the other autumnal. The next search is made for a suitable star. It must be remembered that in the case of a rising star the declination cannot differ much from that of the sun, or else it could not be seen through the same narrow opening, and to be serviceable as a warning star, it must precede in right ascension by a suitable interval; if too short the star could not be seen, if too long its warning would be inconveniently early. Thus the data for the preliminary search are; for declination, that already ascertained for the sun, and for right ascension, one hour less may be taken.

It would occupy too much space to enter into the details of the calculation which involves the change due to the movement of the star from precession; but if the result shows that a conspicuous star or constellation, either in the spring or autumn (and within the limits of possible archeology) occupied approximately the position required by the hypothesis, the discovery will justify a more exact computation. Should it, however, fall for a rising

is inevitable, without there having originally been any intentional correspondence. The answer is not difficult.

First, there are very few available stars. They must be of sufficient brightness; a third magnitude star is the very minimum, and could only be resorted to (unless in a close constellation like the Pleiades or Aquarins) if situated very much by itself, so as not to be mistaken for any other. They must also be near enough to the ecliptic to be seen through the narrow castern opening. A list of fourteen single stars and two star groups exhausts the whole possible number. Moreover, they must be so placed in the firmament as to satisfy the condition required for warning stars. Again, in the two hundred trials made for the fifty temples, as mentioned above, would there (in the case of the assumed multitude of stars) have been one hundred and fifty misses to the fifty hits which were wanted; and if there had been no arrangement, and the orientations had been fortuitous, would the most ancient sites have always secured the oldest orientation dates, and those of which the recent foundation is historically known have taken their proper rank?

It is true that the sequence might have been accept—

temple of Isis at Pompeii is remarkable from there being evidence of a large window having been formed in the temenos wall centrally placed with regard to the eastern axis of the temple, doubtless for the admission of the rising sun and its warning star. The window had been filled up with brickwork at some subsequent date. The last point touched upon in the paper has reference to a group of ten temples of late foundation, of most of which the dates are accurately known. At first these temples seemed to be exceptions to the rules which connect the orientation with heliacal stars, but by allowing a few more degrees of solar depression than what is absolutely necessary for distinct vision, they are found to conform in all other respects. The explanation of this change seems to be that the temple service had become more complicated, and more time was required by the priests for their preparations. Every additional degree of sun depression would add about five minutes for that purpose. The maximum extra allowance in this group of temples is thirty-five minutes. temple of Isis at Pompeii is remarkable from there be minutes.

### TELEPATHY.\*

TELEPATHY.\*

It is generally accepted that each individiual consciousness is insulated from every other; that is, stand in a row ten men, give each a word out of a sentence, and by no process of rubbing their heads together or bringing their heads close together in any way, can you get the whole sentence out of any one or all of them, unless each one gives his word. That defines insulation, My thought is forever my thought alone until I communicate it by some sign which enters your sense organ. It is held that there is an irreducible pluralism

-	-	-	Orienta- tion date	-	-
Greece	Athens	A small temple near Jupiter Olympius The ancient Asclepieium First foundation of Temple of Apollo Rebuilt so as to follow the star The ancient Heræum A Doric Temple	8, c. 780 560 970 ) 630 ) 1830 640	September 23 April 5 March 1 October 24 November 10	Spica setting  Arietis rising  Lupi setting  Antares rising
Calabria	Near Cotrone Near Gerace	Foundations of a temple near San Sansoni Doric Temple Temple of Juno Lacinia on Cape Colonna Ionic Temple of the Locrians	580 1000 610	March 6 March 28 December 21	<ul> <li>β Geminorum settin</li> <li>γ Pegasi rising</li> <li>a Arietis rising</li> <li>β Geminorum rising</li> </ul>
	Girgenti	Ditto rebuilt on same site	430 690 470	April 1 March 20	B Tauri setting A Arietis rising Spica setting
Sicily	Segeste	, , , Concord	450 430 400 550 795	April 14 September 13 April 5 September 30	a Arietis rising Spica setting a Arietis rising a Arietis setting
	Syracuse	Temple D (adjoining and following the star) Temple A	610 550 815 610	October 4 March 5 September 20 October 3	γ Pegasi rising Spica rising  Arietis setting
South Italy	Pœstum Pompeii	,, Diana	450 535 640 750	September 26 March 22 November 12 June 19	Spica rising Spica setting Antares rising B Geminorum rising

For the sake of comparing the above with dates that e archeologically probable, and confining the inquiry

are archæologically probable, and confining the inquiry to the Greek colonies, we may observe:

The Doric capital at Taranto is of an extremely ponderous type, and may well be assigned to the seventh century. A Lacedemonian colony under Phalanthus is reported to have taken possession of Tarentum about 700 B.C.

At Metapontum, at the temple near San Sansoni, nothing but foundations remain; the architectural character of the other is quite in accordance with the orientation date. The city was one of the most ancient in South Italy. One column only remains of the temple on Cape Colonna near Cotrone, and its character is that of the fifth century. In the case of this celebrated temple we clearly have the case of a rebuilding on the old lines.

ing on the old lines. The foundations The foundations of the older temple of the Locrians near Gerace were discovered under the substructions of the later temple. Its orientation date, 610, is quite consistent both with the early Ionic architecture which was found and that of the Hellenic colonization, 683 B. C. That of the later temple is also in accordance with the architecture of the fifth century. Girgenti was occupied by a Greek colony B. C. 582, but a city with so commanding a site had, no doubt, an earlier foundation; and we may feel confident that the temple of Juno Lacinia, though the present structure is Hellenic, was founded by the earlier inhabitants. The remains of the other temples agree in style with the dates assigned to them by the theory. Mention is made by Diodorus of the temple of Jupiter strongly confirmatory of the orientation date 430 B. C. At Segesta the date arrived at is too early by about 100 years to agree with the character of the architecture. It may have been that the Segestans, who seem always to have been a struggling community, may have taken a very long time to have brought their temple to the state of finish at which at last it arrived, for it appears never to have been quite completed. foundations of the older temple of the Locrians

among minds; so that no one of us can clandestinely enter the mind of our neighbor and filch his thought treasures—at least, not until he (metaphorically speaking) lets down his drawbridge and raises his portcullis. This common sense view of isolation and insulation is not by any means proved; though, on the other hand, it may not be absolutely disproved. I propose this evening to present to you some of the reasons for doubting absolute mind insulation. Many things favor the theory of communication between mind and mind, otherwise than through the known channels of the sense. Such communication is called telepathy, or thought transference. It may be defined as the sympathetic affection of one mind by another mind at a distance, through emotional or other influence, without any direct communication by the senses. The phenomena of telepathy are as old, at least, as history. They may be found in witcheraft, soothsaying, oracles, dreams, visions, warnings, haunted houses, ghosts, socalled mind-reading performances, and a long list of et ceteras—in fact, if telepathy can be proved at all, it will be almost as universal in its application as Paine's Celery Compound now is to the ills of the flesh.

As illustrating the meaning of telepathy—"Great minds run in the same channel." Two people sitting together suddenly start to speak of the same subject. Little minds do it as well as great. "Speak of an angel, and you hear the rustle of his wings." You speak of some one, and suddenly the individual enters—who may not be an angel. We decide to write to a friend—that very day we get a letter from him, the letters crossing. Though susceptible of other explanations, these things are suggestive of telepathy.

In one of Plato's dialogues, Aristides speaks to Socrates:

"I never learned from you anything at all. You yourself well know this: but I always made progress."

these things are suggestive of tereparty.

In one of Plato's dialogues, Aristides speaks to Socrates:

"I never learned from you anything at all. You yourself well know this; but I always made progress whenever I was along with you, even in the same house, but not in the same room with you; yet most when I was in the same room with you; and even in the same room, I got on better if I looked at you when I was speaking, than if I looked anywhere else; but I got on the very best of all if I was sitting near you or touching you; but now, having been away from you, all my character has dribbled out of me."

In the same dialogue, Timarchus was eating supper with Socrates, and bent on the commission of a crime, of which intention Socrates was absolutely ignorant. Timarchus excused himself for a little—soon to return. "if I may;" but "the divine voice came to me," quoth Socrates, "and I said to him, 'By no means arise from the table;' and he stopped. And after a time he got up to go out, and said, 'Now I must go out,' and again the sign came to me, and again I made him stay. The third time, being determined I should not see him, he arose, and said maught to me, when my attention was otherwhere, and went forth and did that which was his doom."

ure at Haverford College, Haverford, Pa., by Prof. Rufus M.

thought transference. Contagious diseases have been the study of mankind from time immemorial; but it was only when the bacilli were got under the microscope of the laboratory and showed their baleful work when planted in animals that everybody accepted the

when planted in animals that everybody accepted the germ theory.

Malcolm Guthrie, of Liverpool, assisted by men of reputation and science, found it possible to transfer sensations of taste, odor, sound, color, as well as impressions of visual objects. One person would think of a number, which was then transferred to the thought of another. They reproduced drawings; and, out of 457 trials, including the tests of the four senses above named, they had 237 complete successes and 82 partial successes. A multitude of such experiments have been made with varying success, the results putting the coincidence indisputably beyond the possibility of accident or guesswork.

Mind reading is really muscle reading. The mind

lent or guesswork.

Indicate the mind reading is really muscle reading. The mind cader blindfolds himself and has you go out and hide mything in the yard or elsewhere; when you come in, so leads you by the hand and finds it—and this, by he twitch of the muscle.

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Mund reading is really musele reading. The mind reader blindfolds himself and has you go out and hide anything in the yard or elsewhere; when you come in, he leads you by the hand and finds it—and this, by the twitch of the musele.

No idea ever enters a person's mind clearly and distinctly that does not produce a muscle movement. If you have appointed any position in this house, and place your hand in that of a person with sensitive touch, he feels the drawing in your hand toward the place. So distinctly does he feel it, that he will lead you right there; but, really, you lead him. Watching a person who is fainting, everybody must have noticed the movement of the lips. The skillful muscle reader will skill and read from your lips. The skillful muscle reader will skill and read the lips. The skillful was not to, and then tell you what it is. He watches your face intently, and sees your lips moving enough to read the word from your lips. I have watched a person in Friends' meeting say "Amen!" when he would not, for anything, have said it. There is hardly a person here who can think of "bladder," and not say bladder; their lips will either move so they can be seen, or incipiently. Intent thinkers whisper their thoughts. A student often tells his classmate the answer to a question, absolutely without knowing he does it; because, thinking intently, he whispers it; and much of this so-called mind reading is simply this acute sense of hearing the unconscious whispers.

There are unmistakable indications that the hypnotic state presents a specialized manifestation of rapport which must exist between agent and percipient in hought trusty and the state of hypnotism, or hysteria, can never think of two things at once); and the experimenter, behind her back, put some salt in his mouth, and the person holding her attention to something in front (and one in a state of hypnotism, or hysteria, can never think of two things at once); and the experimenter, behind her back, put some salt in his mouth, and the

and the tuning fork man right abalgate a present.

A Miss X (we will call her), of great scientific ability, for three months kept a diary of the supposed events occurring in the life of a friend in another county, making the entries every night; and a great many nights when she made these entries, her friend made almost the identical entries in her diary.

August 15, she wrote "She is playing 'Hellas."

August 17, "She is playing 'Slumber Song,' between '35 and 7:50." Entirely correct.

September 14, "Playing 'Hellas." She was not.

November 18, "Chopin's 'Dead March.'" Right, she was.

e was.

November 26, "The 'Elite:' never gets finished."

te was playing "Elite;' and somebody interrupted
d she did not finish.

These are all striking instances, because of the char
ter of Miss X, and because of the number of great

ccesses in the experiments.

In the case of the celebrated Dr. Dupré, who, when called in to a certain patient in a paroxysm of pain, would hypnotize her and bring relief, an enforced absence of several weeks brought about an agreement between physician and husband that the latter should telegraph whenever an attack came on, and as soon as Dupré was advised he would sit down and put his mind on the matter for awhile and try to get her to go into a hypnotic state. The first time the telegram had not been received more than a half-hour before he got another saying "She is asleep." Then in a little while he had another telegram saying, "She is awake." Dupré repeated this telepathic treatment in this case five or six times, successfully.

After all deductions are made for fraud, for whisperings, for lip movements, muscle movements, coincidence (of course, there would be a great many coincidences), there are numerous cases in which sensations are more or less entirely reproduced without the sense organ of the percipient being affected.

An old lady was relating to Miss Cobb, a great scientist, that ten years back, at a seance, a large mahogany table began to move around and around and then lifted up its legs and knocked on the floor when there was nobody within a yard of it. When questioned she said she knew it was so, as she wrote a full account at the time in her diary. A reference to the original entry showed that the whole company were sitting with their hands on the table. This shows the necessity for clearness of memory; and that stories may grow unconsciously. Unless stories are recorded immediately after the occurrence they are worthless as seintific evidence.

No supernatural or post-mortem ghost is required to account for the figure which calls for help or speaks one's name. The figure seen is certainly a thought in the mind of the percipient; it is always so in all these cases. We see our friends in our dreams and they are awhile real, external, to us; as the trees are when we are awake. It is not uncommon with many persons to have a

have an idea in the minu to produce an object which wide awake; and such an object is called an hallucination.

Many hallucinations are so distinct, visible and real—external—to the persons seeing them as to have after images of them; just as when you see the sun and afterward other objects, you see a green disk there, which is the complementary color. The brain process which produces a dream in sleep and an hallucination in a person awake is precisely the same. In both cases the thought arises out of a subterranean intelligence (that is, the subconscious cell) and affects us so foreibly that we regard it as an object external to us, which may be seen, or touched, or heard, or all three. A census of hallucinations has been taken in England and America; and so far as it is safe to draw conclusions from such a limited census, it is found one person in every ten has had an hallucination so distinct and real as to leave a lasting memory impression. Out of all these hallucinations studied many are veridical, corresponding with the real event, which occurs simultaneously or nearly so. If these veridical or truthtelling hallucinations were very rare, we might easily suppose that the event and the hallucination were chances—coincidences; but the coincidences are four hundred times more numerous than chance would allow.

Telepathy explains that an emotional stress, caused

Indices—coincidences; but the coincidences are four hundred times more numerous than chance would allow.

Telepathy explains that an emotional stress, caused by some great crisis in the life of the agent, projects an impression into the subconscious stratum of the intelligence in the mind of the percipient, that is, the person who has the vision. Here the impression is liberated and the picture in due time is flashed out fully formed, to the ordinary consciousness, and is viewed as an external object. There is, of course, no more difficulty in supposing that a person, by thinking of himself, should cause an image of himself to appear to a second person, than that by thinking of the number 27, he should cause a person to say it; or by eating olives, he should cause as econd person to taste them.

Persons have the same dreams simultaneously, which cases may possibly be explained as chance coincidences, or that the sleeper indicated his dream in unconscious whisperings audibly enough to suggest the same dream to his bedmate; but those who have studied the cases carefully enough would not admit that they cover all the cases.

This happened at Brantwood, England, in the house

carefully enough would not admit that they cover all the cases.

This happened at Brantwood, England, in the house of John Ruskin, and was reported through him. The lady is giving her experience, Mrs. John R. Savin. "I awoke with a start, morning of October 7, 1883, feeling I had had a hard blow on my mouth, with the distinct sense I had been cut and was bleeding on my under lip; and I seized my pocket handkerchief and held it to the spot. Removing it after awhile, I was astonished not to see any blood, and then only realized that it was impossible that anything could have struck me. I looked at my watch and saw it was 7; and finding my husband was not in the room, I concluded he must have gone to the lake for an early sail. I then fell asleep. At breakfast, half-past nine, Arthur came in rather late; and I noticed he put his pocket handkerchief up to his lip in the very way I had done. I said, 'Arthur, why are you doing that;' and added, 'I know you hurt yourself, but I will tell you why afterward.' He said, 'Well, when I was sailing a sudden squall came, throwing the tiller around, and it struck me a bad blow in the mouth on the under lip.' I then said, 'Have you any idea what o'clock it was when it happened to me, much to the surprise of all who were at breakfast."

Induced or experimental telepathy, a case by the

Induced or experimental telepathy, a case by the Rev. Clarence Godfrey, a minister of the Church of England. He had read an account of some person's dwilling himself to appear in the room of a friend. "Retiring at 10:45, November 15, 1886, I determined to appear, if possible, to a friend; and accordingly I set myself to work with all the volitional and determinative energy I possessed to stand at the foot of the bed. I never dropped the slightest hint beforehand as to my intention; nor had I mentioned the subject to her. As the agent, I will describe my own experiences." He sat down then and willed himself to appear in this room. "The next thing I was conscious of was meeting the lady next morning" (that is, in his dream) "and asking her at once if she had seen me last night. The reply came 'Yes.' 'How?' I inquired. Then, in

words strangely clear and low, like a well audible whisper, came the answer: 'I was sitting beside you.' These words awoke me instantly and I felt I must have been dreaming; but on reflection I felt I had been willing when I was asleep. My watch showed 3:40 A. M. 'The foregoing is what I wrote immediately in pencil, standing in my night dress. The words struck me as quite intuitive, as my own conviction, rather than a communication from anyone else; and yet I cannot remember, or even tell, as one can after a vivid dream; but the words were uttered in a clear, quick tone, and awoke me at once. My friend, in the note which she wrote me, gives the following experience; 'Yesterday morning, November 16th, 1886, about halfpast three, I awoke with a start and the idea that someone came into the room. I experienced a strange, restless longing to leave the room and go downstairs. This feeling became so overpowering that at last I went down, thinking, if I could get some soda water, it might have a quiescent effect. On returning to my room I saw Mr. Godfrey standing beside the window. He stood there and I held up the candle and gazed at him three or four seconds, and gazed at him in utter amazement; and then, as I gazed at him, he disappeared. I was not frightened at the appearance of Mr. Godfrey; but felt much excited and could not sleep afterward.'"

Dr. Joseph Kerr states: "I had been rather closely engaged on some auditing work which had tired me; and as near as I can remember, the time was between 3:30 and 4 P. M. I laid down my pencil, stretched myself, and, in the act of doing so, I was seized with the impulse to make a trial on Miss G. I did not, of course, know where she was, for the moment; but with a flash I transferred myself into her room. I cannot say why I did so; unless my first experiment had been successful.

"As it happened, it was what I might call a lucky shot: for I caught her at the moment she was lightly

self, and, in the act of doing so, I was seized with the impulse to make a trial on Miss 6. I did not, of course, know where she was, for the moment; but with a flash I transferred myself into her room. I cannot say why I did so; unless my first experiment had been successful.

'As it happened, it was what I might call a lucky shot; for I caught her at the moment she was lightly sleeping—a condition which seems to be particularly favorable for receiving telepathic messages. The figure was clothed in a suit I was at that moment wearing, and was bareheaded. This suit is of a dark reddishbrown check—soft—and it was an unusual circumstance for me to have had the coat on at the time; as I wear, as a rule, an offlice coat of a light material; but this office coat I had a day or so before sent to the tailor for repair, and I therefore kept on the dark suit. At our next meeting, when she was recounting her experiences, I asked her how I was dressed—which is not at all a leading question. The reply of Miss 6; was touching the sleeve of the coat of the light suit I was then wearing): "Not this coat, but the dark suit you had been bodily present. I even saw clearly the solitary check pattern on ft. I saw your features as if you had been bodily present. I could not have seen you more distinctly."

There is a case happening to a boy at play; and his mind was not on such subjects at all—an account given by Miss Olive Carey Booth. "On April 10, 1889, at about half-past nine o'clock, my youngest brother and I were going down a short flight of stairs to the kitchen to fetch some food for my chickens, as usual. We were about half way down and my brother a few steps in advance of me, when suddenly he said, 'Why, there is John: I didn't know he was in the house. 'That was a boy not far from us who had been employed in the house as a hall boy not far brow may be one to flaver and the original part of the wear of the wear of the passage and say one on the same of the passage and say. The person is seen often two or three hours, or,

Col. H. had two friends in the Transvaal war. Col. H. had two friends in the Transvaal war. He awoke with a start—"The gray dawn stealing in through the windows and the light fell sharply and distinctly on the military chest of drawers at the further end of the room, and which I had carried about with me everywhere during my service. Standing between me and the chest of drawers I saw a figure, which, in spite of the unwonted dress (unwonted, at least, to me) and of a very black beard, I at once recognized as myold brother officer J. P., who had on his usual coat, the brown leather strap of his field service glass across his breast, a brown leather girdle passed around his waist; on his head he wore the ordinary white pith helmet of his service. His face was pale; but his bright black eyes shone as brightly as when, a year and a half before, they had looked upon me bidding me adieu. Fully impressed, for a brief moment, that we were stationed in Ireland, I said, 'Halloo! P. Am I hat for parade?' He looked at me steadily and replied, 'I am shot.' 'Shot!' I exclaimed. 'How and where?' 'Through the lungs,' replied P.; and, as he spoke, his right hand moved slowly up the breast until the fingers rested over the right lung. 'What were you doing?' I asked. 'The general sent me forward;' and the right hand left the breast and moved slowly toward the front and at the same moment the figure melted away. I sprang out of bed. It was then 4:10 A. M. by the clock on the mantelpiece." J. P. did get shot in the lungs just at that time.

The unquestioned fact in stories of ghosts and haunted houses—after we make due allowances for fraud, exaggeration and conditions made by the imagination—seems to be a telepathic hallucination, It will generally be found that some one in the family had heard that the house had a reputation of being haunted; and this idea becomes persistent in the mind and finally produces the hallucination of a form, a voice or a strange sound; and this hallucination is transformed, as dreams are sometimes transformed, from one mind to another.

MEDIUM SEANCES.

ally produces the hallucination of a form, a voice or a strange sound; and this hallucination is transformed, as dreams are sometimes transformed, from one mind to another.

MEDIUM SEANCES.

The nucleus of fact in medium seances, after all necessary deductions are made, is still more surely telepathic knowledge. There are very few instances, in deed, of any medium telling a sitter any information which might not have been consciously in his mind, or in his subliminal consciousness; that is, in his subconscious. It is now proved, beyond the shadow of a doubt, that our clear, distinct consciousness is but a small, selected fraction of our potential consciousness. Every impression from our earliest childhood—every odor, every taste, every sight, every sound, every muscle movement—has left its contribution in this subconscious life of ours. Sometimes we reach down the hook and fish up something which we never knew was there; and sometimes a person with telepathic power can do it for us. It is just so. We find, for instance, that Helen Kellar remembers, that is, there is a memory that has been in her subconscious self until recently, a memory of music her father played to her before she was sighteen months old (because she lost her hearing, sight, and voice at eighteen months and has not been able to hear a sound since); and yet the memory of that music, played to her before eighteen months, has been flashed up out of her subconscious self—in act, it has been proved conclusively that nothing ever enters anyone's consciousness but may be flashed up—nothing, absolutely nothing. You have lost your spectacles, and in a day or so feel you put them away in your pocket. You go to a medium and ask the medium to tell you where you have lost your money. The medium, after a time, tells you you put it in a book in such and such a room, or in such and such a bockcase; and you go home and fluid: You knew it you have lost your money. The medium, after a time, tell you you put it in a book in such and such a room, or in such and su

Those who, eye to eye, shall look on knowledge."

Tesla says we shall one day, soon, telegraph without wires. Shall we also communicate without telegraphs? With all the advances this would bring it would certainly be more or less inconvenient to have our neighbor sit and read us like a book without paying the proverbial penny for our thoughts; and I am willing to risk a prophecy that definite, self-possessed individuality, insulated enough for all practical purposes, has come to stay.

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